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VALERIANA IN NORTH AMERICA AND THE WEST INDIES (VALERIANACEAE)*

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The present treatment is the first taxonomic revision covering the North American and West Indian species of *Valeriana* since that of Höck[1] (1882). The taxa within this geographical province have not suffered from lack of recognition, as may be witnessed by the rather copious synonymy, but rather from the want of a general re-evaluation of these past efforts in an attempt to bring a semblance of order and utility to the natural populations of North American *Valeriana*.

Taxonomically, the genus as a whole remains poorly known. The European species are more often studied, although for the most part floristically. *Valeriana officinalis* and *V. Phu*, amongst others, are known from antiquity especially for the medicinal properties of their fetid "valerian root". The most recent work on American *Valeriana* is that of Borsini[2] who treated the Argentine species.

Valeriana occurs in all the continents with the exception of Australia, and in number of species, totaling perhaps 200, the genus compares with those genera largest amongst flowering plants. In the western hemisphere, *Valeriana* attains its greatest complexity in the South American mountains where the largest number of species is concentrated. Höck's treatment[1] accounted for 155 species of *Valeriana* world-wide, of which 30 were of North America and the West Indies. His disposition of the North American species was limited by a paucity of material, and, while conservative, it hardly fulfilled the need of a detailed account based upon abundant field data and herbarium specimens. In the decades that followed, an increasing number of names appeared in the literature, and with well over 100 specific epithets with which to deal at the beginning of the present study, there was an urgent need for an account of the North American and West Indian

[1] Engl. Bot. Jahrb. 3:1–73. 1882.
[2] Gen. et Sp. Plant. Argent. 2:275. 1944.

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species as a whole. A monograph covering a selected geographical area, such as the present, limits the interpretation of extra-territorial distributions, but this method is the only means open for a full-fledged evaluation of the relationships of taxa within a natural taxonomic system.

One of the results of the present study has been the determination of extra-North American affinities, and I have discovered, for instance, that nearly one-fourth of the species also occur outside the geographical limits of this paper, five extending to South America and two to Asia and Europe. The interpretation of taxa has been solely on the basis of comparative morphology, and 30 indigenous North American and West Indian species are listed in the treatment that follows.

Historical Review

The name *Valeriana* is derived allegedly from the Latin *valere*, to be strong, or from *Valerius*, a Roman family name, or from *Valerus*, the name of a Roman king. In Greece the plants of this assemblage were known as *Phou* (φου).

Valeriana as a generic epithet appears in the works of Theophrastus, Dioscorides, and Plinius. To them this plant was important largely because of its medicinal qualities, and to this day *Valeriana officinalis* is listed in the United States Pharmacopoeia for use in mild cardiac therapy. The history of its medicinal use is correlated with the advance of botanical knowledge, and some of the earliest incunabula illustrate *Valeriana*. We find an interesting but stylized black and white wood-block print of *Valeriana* in the 'Herbarius Latinus', printed at Mainz in 1484, and a hand-colored print in 'Gart der Gesundheit' of 1487, printed in Augsburg by Hannsen Schönsperger.

Valeriana found its place in the tomes of all the early sixteenth century herbalists, and Cesalpino[3], the Italian physician, placed *Valeriana* with those plants having a solitary, single-seeded fruit. But these renaissance classifications contributed little new information, and not until 1700 did *Valeriana* rise as a result of Tournefort's more modern approach. Tournefort[4], in his re-evaluation of earlier classifications, incorporated *Valeriana* and the newly erected *Valerianella* in his Class II, Section III, with flowers gamopetalous, infundibuliform and rotate, with the calyx unfurled in fruit. This interpretation was a major advance, and Linnaeus, in the 1753 edition of 'Species Plantarum' recognized 16 species of *Valeriana* in the genus with the "Triandria Monogynia". His interpretation was conservative and in his list were included species of *Valerianella*, *Fedia*, and *Centranthus*, which have since been recognized as separate genera of Valerianaceae. In Linnaeus' second edition (1762), the number of species reached 18, and *V. scandens* was described as the first American species.

Jussieu[5] made no attempt to alter Linnaeus' concept of *Valeriana* although he placed the genus in his newly erected family Dipsaceae. Necker[6] first devised the

[3]De Plantis. p. 147. 1583.
[4]Inst. Rei Herb. 1:131. 1700.
[5]Gen. Pl. p. 195. 1789.
[6]Elem. Bot. 1:123. 1791.

Valerianaceae and recognized five genera: *Valeriana*, *Centranthus*, *Mitrophora*, *Odontocarpon*, and *Mouffetta*.

A. P. DeCandolle[7] proposed 11 genera of Valerianaceae in its first world-wide treatment. For *Valeriana* 82 species were recognized of which 10 were North American, and he placed the family between the Rubiaceae and Dipsaceae which is essentially the same disposition as the most recent one by Höck[8].

Endlicher[9] (1836–40) failed to treat the genus, although the Valerianaceae were placed between the Plumbagineae and the Dipsaceae. Bentham and Hooker[10], like DeCandolle, placed the Valerianaceae between the Rubiaceae and the Dipsaceae. Höck's[11] (1882) monograph is the last disposition of the species for North America, and his treatment was later included in Engler and Prantl's[12] 'Die Naturlichen Pflanzenfamilien'.

Valeriana pauciflora was described by the younger Michaux in 1803 as the first species recognized from North America and the West Indies, and by 1850 over half the known species from this geographical area had been recorded, mainly as a result of botanical expeditions—Humboldt and Bonpland, Galeotti, and Hartweg, in Mexico; and Nuttall, Douglas, and Richardson, in western United States and Canada. Asa Gray's[13] treatment of *Valeriana* was the last to list the species north of Mexico.

General Morphology

Habit:—The North American species of *Valeriana* are hollow-stemmed perennial or annual herbs, ranging in size from that of the often diminutive napiform-rooted species, such as *V. densiflora*, sometimes no more than six inches tall, to that of the voluble *V. scandens* with branches up to twenty feet long. The erect perennial and annual species normally flower and fruit in response to seasonal fluctuations of climate, but the voluble *V. clematitis* and *V. scandens* are mostly everblooming and evergreen over much of their distribution in the warmer sections of tropical and subtropical America.

The underground parts are useful for series designation and the species fall generally into two distinct groups: (1) those with *tap-roots* (Mexico and Central America), and (2) those with *rhizomes* (north of Mexico). (Fig. 1).

1. The species with persistent primary roots may be divided into two groups, namely: (a) those with conical tap-roots, and (b) those with napiform to fusiform tap-roots:

(a) Conical tap-roots are characteristic of the three North American species in series Edules.

[7] Prod. 4:623. 1830.
[8] Bot. Jahrb. 31:405. 1902.
[9] Gen. Pl. p. 350. 1836–40.
[10] Gen. Pl. 2:151. 1873.
[11] *l. c.*, p. 1. 1882.
[12] Nat. Pflanzenfam. 44:178. 1897.
[13] Syn. Fl. N. Am. pp. 42–44. 1886.

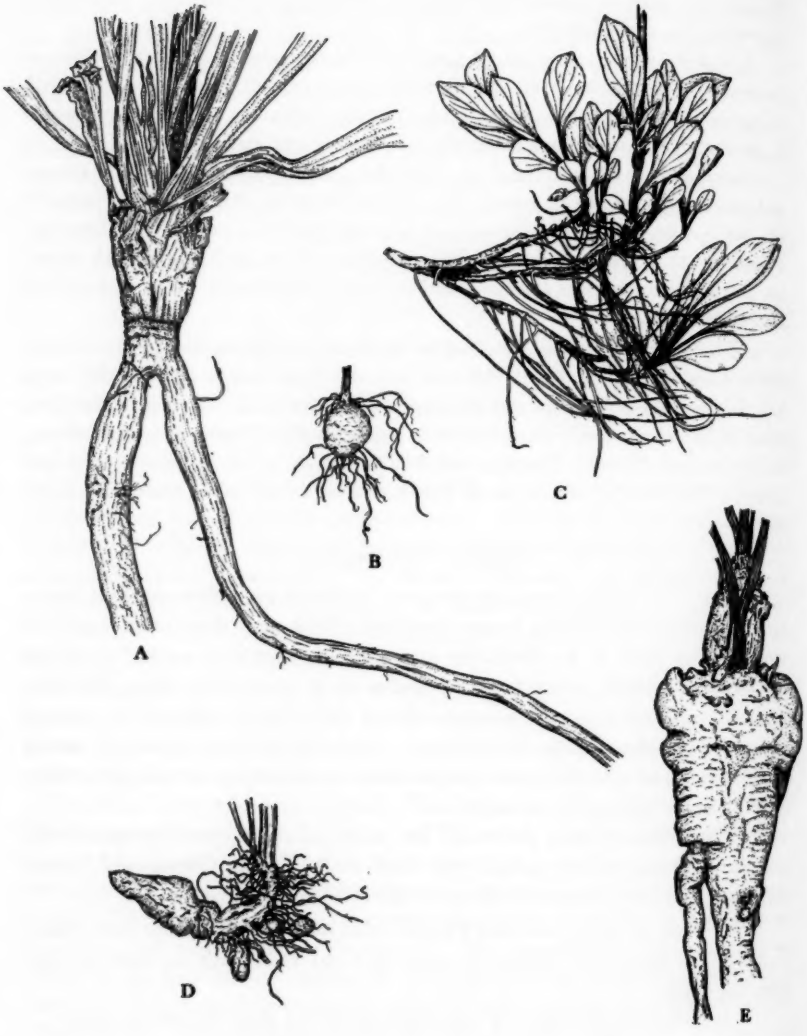

Fig. 1. (× 1/3). A, branched tap-root of *V. edulis*, characteristic of the species in series EDULES; B, napiform tap-root of *V. densiflora densiflora*, characteristic of the species in series SORBIFOLIAE; C, rhizomes of *V. capitata acutiloba*, characteristic of the species in series OFFICINALES; D, fusiform tap-root of *V. densiflora barbareaefolia*; E, conical tap-root of *V. albo-nervata*, characteristic of the species in series CERATOPHYLLAE.

(b) Napiform to fusiform tap-roots are characteristic in series CERATOPHYLLAE, CLEMATITES, DENSIFLORAE, SORBIFOLIAE, and PRATENSES. The distinctions between the perennial and annual habit in the napiform-rooted species are based primarily upon the relative differences in the degree of swelling, which perforce does not always delimit annuals from perennials satisfactorily. For instance, several of the species in series DENSIFLORAE, CLEMATITES, and SORBIFOLIAE manifest transitional forms from well-developed napiform tap-roots to those in which the swelling is often quite rudimentary as in *V. densiflora, apiifolia, Selerorum,* and *urticaefolia.* The Mexican and Central American species with napiform tap-roots often occur in areas of seasonal drought, and it is conceivable that the annual or perennial habit may be linked to the severe conditions of an arid habitat.

2. The rhizomatous species are included almost wholly in series OFFICINALES in which the often much-ramified and branched rhizomes are diagnostic. In series SORBIFOLIAE, rhizomes occur in *V. domingensis,* and dubiously so in *V. clematitis* and *V. scandens,* in which the underground portion is rarely preserved in herbarium material.

Leaves:—The leaves in all the species are opposite and decussate, and the spatulate leaf epitomizes the basic leaf type in North American *Valeriana.* The leaf of *V. edulis* is the best example of this shape, and the pinnate, pinnatifid or bipinnatifid leaf are modifications of this basic form. The leaves are the most variable of all the taxonomic criteria, although the characteristic variational pattern is often diagnostic for species determination.

Undivided leaves are predominant in series EDULES and CLEMATITES, but the leaves in series OFFICINALES, CERATOPHYLLAE, DENSIFLORAE, SORBIFOLIAE, and PRATENSES are more frequently pinnate to pinnatifid. The leaves in *V. apiifolia* and *V. robertianifolia* are bipinnatifid, and the laciniate leaves in the species of series CERATOPHYLLAE are the most divided of the North American species.

Indument:—The kinds of pubescence, whether of the hirtellous, pilosulous, sericeous or puberulent types, offer a useful means for characterizing the series. The nodes of most species are consistently puberulent or pilosulous, and in six of the seven series, the throat of the corolla is pilosulous, but in series CERATOPHYLLAE the corolla-throat is densely short-sericeous, a character which readily marks this group of species.

The disposition of the indument often contributes to the diagnostic features of the achene. In the series OFFICINALES, EDULES, DENSIFLORAE, and PRATENSES the achenes are glabrous or pubescent on the adaxial and abaxial sides, but in series CERATOPHYLLAE, CLEMATITES, and SORBIFOLIAE the achenes are more often pubescent on the adaxial and glabrous on the abaxial surface.

Inflorescence:—The compound inflorescence of *Valeriana* has been interpreted as a thyrse, and Philipson (Ann. Bot. n. s. 11:409. 1947), on anatomical grounds, finds the thyrse in *V. officinalis* considerably modified as a result of arrested growth patterns of the apical meristem. This conclusion bears out my observations that

the inflorescence in *Valeriana* is probably not a true thyrse of the mixed type but merely thyrsoid and actually determinate throughout. The inflorescence in North American species is manifestly of the *V. officinalis* type. Two forms may be recognized: (1) An *aggregate dichasium*[14], which is initially more or less pyramidal. This type predominates in the North American species and is apparently produced through the reduction of decussate leafy branches from a falsely monopodial central axis; (2) A *compound dichasium*, which is dichotomous, with the ultimate dichotomies closely aggregated and more or less flat-topped in anthesis, although later becoming diffuse and somewhat more elongated. The compound dichasium is found consistently in *V. deltoidea*, *tanacetifolia*, and *pratensis*. The terminal cymes are scorpioid, and the ultimate branches form the cincinnus. In most species the cincinni are not evident until maturity, although the heliciform branches of *V. apiifolia* and *urticaefolia* are well developed even in immature plants.

Corolla:—Relative lengths of the corolla tube in North American *Valeriana* contribute an outstanding character for both series and species delimitation. The corolla may be: (1) infundibuliform to subsalverform with the tube usually twice as long as the lobes and gibbous at the base (except in series PRATENSES it is sometimes indistinctly gibbous towards the middle), or (2) rotate, with the tube straight and much abbreviated and the lobes usually as long or longer than the tube. Modifications of these types occur in *V. pauciflora*, *columbiana*, and *urticaefolia*, with subsalverform corollas, and in series SORBIFOLIAE, with campanulate-infundibuliform corollas. The corollas of *V. pauciflora* and *V. columbiana* are the longest, to 20 mm., of the North American species. Rotate corollas occur in *V. occidentalis* and *V. dioica* in series OFFICINALES and in most species in series EDULES and CERATOPHYLLAE. The five corolla lobes are imbricate in bud and at anthesis they expand at right angles or frequently they are recurved, rarely erect. The flowers with infundibuliform corollas are more or less asymmetrical. Rotate corollas, on the other hand, are usually symmetrical.

The presence of unisexual as well as perfect flowers in many species of *Valeriana* is expressed differentially in the length of the corolla. Unisexual flowers, for instance, are invariably reduced in length by at least half that of the perfect flowers. Sexual polymorphism occurs in several ways; the flowers may be completely hermaphroditic, polygamous, dioecious or polygamo-dioecious, with dioecism the least common of these sexual anomalies. Most of the species are characteristic for one or more of these sexual traits; for instance, the flowers of *V. edulis* are predominantly polygamo-dioecious, while those of *V. sitchensis* are consistently hermaphroditic.

The methods of pollination are as yet unknown, although my observations on several species in western United States indicate that small insects, of undetermined kind, assist in this process.

[14] Woodson, Ann. Mo. Bot. Gard. 22:4. 1935.

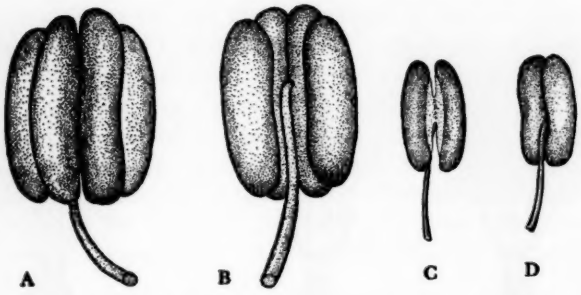

Fig. 2. Anthers: A and B, 4-lobed type, × 10; C and D, 2-lobed type, × 8.

Stamens:—The versatile anthers in North American species of *Valeriana*, while consistently 4-loculate, are of two distinctive types, viz. 2-lobed or 4-lobed; illustrated in fig. 2.

In the 2-lobed and more common type, the anther thecae usually are somewhat lunate and opposed, with the 4-loculae equal in length. This anther type occurs in the North American series CERATOPHYLLAE, CLEMATITES, DENSIFLORAE, SORBIFOLIAE, and PRATENSES, which include Mexican, Central American and West Indian species. The material studied for comparison shows that most of the South American species also have anthers of the 2-lobed type.

In the 4-lobed type, the anther thecae are sulcate, with the ventral loculae of each theca slightly longer than the dorsal and essentially parallel. This type occurs in series OFFICINALES and EDULES, and was also seen in material from certain South American species and in all the European and Asian species examined. While these anther characters have no value for species distinctions, the 2- or 4-lobed anthers have been most useful for series designation.

The stamens of most species are exserted and longer than the corolla lobes, although in series SORBIFOLIAE the stamens are mostly included and essentially sessile at the summit of the throat of the corolla.

Achenes:—The inferior cypselate achene of *Valeriana*, with its epigynous setose calyx-limb and single fertile carpel, represents a reduction from a basically 3-carpellate ovary. On the abaxial side, the vestigial carpels are seen as two often indistinct protuberances near the apex of the achene, and the accompanying vascular traces occur as two submedian ribs adjacent to the abaxial midrib. Variations in the length, the shape, and the indument are the most useful achene characters for species diagnosis (fig. 3).

Calyx-limb:—The modified setose calyx of *Valeriana* is referred to as the calyx-limb. This structure is apparently derived through the progressive dividing of calyx bundle traces in the normal development of the epigynous calyx. The setose calyx-limb in *Valeriana* is allegedly homologous with the pappus in Compositae, although at present we lack information concerning this alleged relationship.

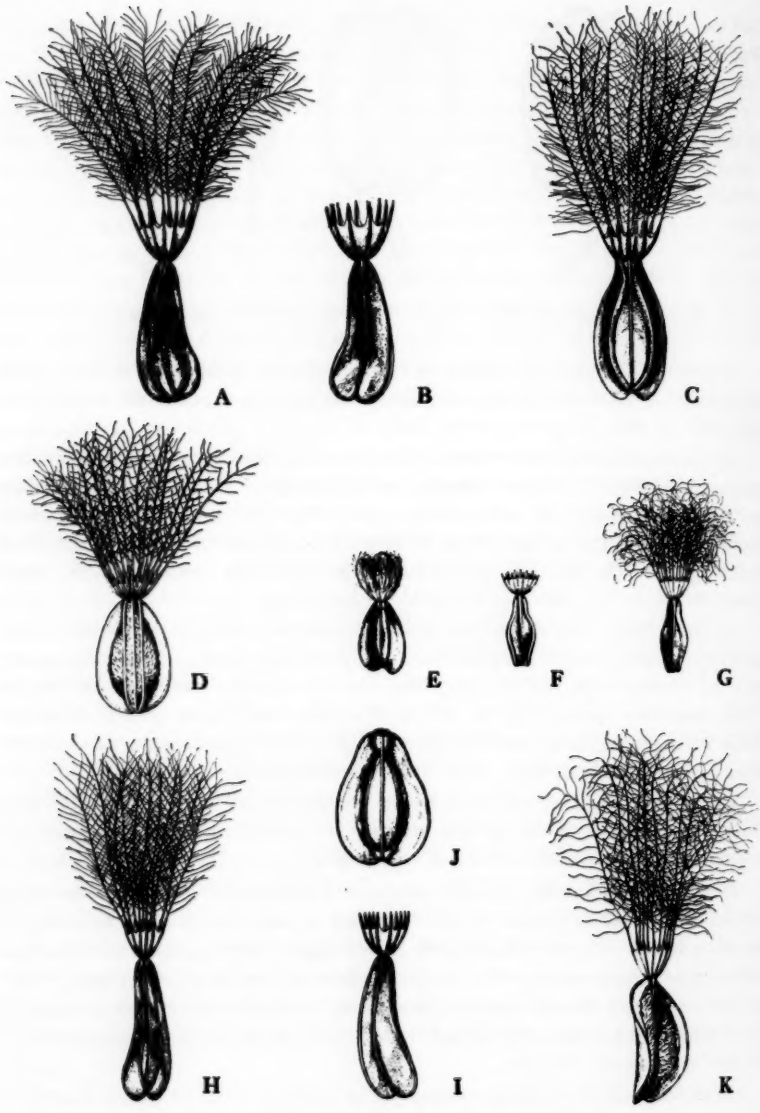

Fig. 3. Achenes: A and B, *V. cucurbitifolia* (A, abaxial side, B, adaxial side), × 6; C, *V. scandens* (abaxial side), × 7; D, *V. pauciflora* (abaxial side), × 6; E, *V. pulchella* (abaxial side), × 4; F and G, *V. Selerorum* (F, adaxial side, G, abaxial side), × 4; H and I, *V. clematitis* (H, abaxial side, I, adaxial side), × 8; J, *V. pratensis* (abaxial side), × 4; K, *V. Palmeri* (adaxial side), × 6.

During anthesis the calyx-limb and plumose segments are tightly inrolled, while at maturity they unfurl, the divided limb usually displaying 6–23 segments. In *V. apiifolia, pulchella,* and *deltoidea,* the calyx-limb may be either setose or merely dentate. In *V. pratensis,* it is consistently dentate. Graebner[15] (1906), in his classification of *Valeriana,* rightly discredited the value of the setose calyx-limb as a generic or subgeneric character, although Höck (1882) and his predecessors ascribed considerable importance to this character, first for generic and later for series designation. In the North American species, the presence or absence of the setose calyx-limb is diagnostic only in combination with other characters.

Geographical Distribution

The international boundary between the United States and Mexico marks an obvious discontinuity for the distributions of the North American species.

Northern Province:—Within this area occur the species in series Officinales and Edules. In addition to *V. dioica* and *V. capitata capitata,* which are found in Asia and Europe as well as in America, series Officinales includes a host of European and Asiatic species. The species in series Edules are wholly American.

Southern Province:—This region includes Mexico, Central America, and the West Indies, in which occur the series Ceratophyllae, Clematites, Densiflorae, Sorbifoliae, and Pratenses. These series manifest an affinity with South American *Valeriana,* and *V. clematitis, urticaefolia, scandens, robertianifolia,* and *sorbifolia* are common to both continents.

Classification

No up-to-date general classification exists for the genus *Valeriana,* although the family was last treated on a world-wide basis by Höck[16] in 1882. P. Graebner[17] began an extensive monograph of the family which covered mostly the South American species.

Valeriana is one of seven to nine genera of Valerianaceae. The various genera are distinguished principally on the basis of stamen number as a reduction series from a basically 5-merous whorl: *Nardostachys,* an Asian genus, has 4 stamens, *Valeriana* 3, and *Centranthus* and *Fedia,* both Mediterranean genera, each have 2 stamens.

The species of *Valeriana* covered in the present treatment are included in seven series, five of which are used for the first time and two being upheld from Höck's earlier classification. The synopsis that follows is a summary of the genus covering the North American and West Indian species as interpreted by me.

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[15] Engl. Bot. Jahrb. 37:464. 1906.
[16] Engl. Bot. Jahrb. 3:1–73. 1882.
[17] *l. c.* 37:464. 1906.

Ser. Officinales
- *V. officinalis*
- *V. sitchensis*
- *V. capitata*
- *V. arizonica*
- *V. pauciflora*
- *V. columbiana*
- *V. occidentalis*
- *V. dioica*

Ser. Edules
- *V. texana*
- *V. prionophylla*
- *V. edulis*

Ser. Ceratophyllae
- *V. laciniosa*
- *V. albo-nervata*
- *V. ceratophylla*

Ser. Clematites
- *V. clematitis*
- *V. Selerorum*
- *V. urticaefolia*
- *V. cucurbitifolia*
- *V. palmatiloba*

Ser. Densiflorae
- *V. apiifolia*
- *V. vaginata*
- *V. densiflora*
- *V. deltoidea*
- *V. pulchella*

Ser. Sorbifoliae
- *V. scandens*
- *V. domingensis*
- *V. robertianifolia*
- *V. Palmeri*
- *V. sorbifolia*

Ser. Pratenses
- *V. tanacetifolia*
- *V. pratensis*

Economic Importance

Valeriana is of economic importance principally for the medicinal properties in the root, sometimes as an aromatic perfume, less frequently as a culinary herb *(Valeriana edulis)*. The medicinal properties of *Valeriana* have long been recognized. The species most used commercially has been the European *Valeriana officinalis*, although other European and Asian species have been used at intervals. The strong fetid and aromatic odor so characteristic of *V. officinalis* is common to many North American species, especially in the series Officinales and Edules, although none of the American species are used medicinally, so far as known.

The "fetid roots", according to Lindley[18], bring on, "as is well known a kind of intoxication in cats, and in large doses occasioning in man scintillations, agitation, and even convulsions". The therapeutic value of Valerian root has a reputation of long standing. It has been used externally for epilepsy and is purported to have cured this disease in Fabius Columna, a well-known herbalist of the 17th century. Barton[19] claims that *Valeriana* is very efficacious in epilepsy produced

[18] Pickering, Chron. Hist. Pl. p. 518. 1879.
[19] British Fl. Med. p. 391. 1877.

by anger and fear. It has also been used for nervousness, suffocation, asphyxiation, migraine, menopause, fevers, and parasites. Allport[20] lists its uses as a nervine stimulant to the digestive organs.

The culinary properties of *Valeriana* remain improperly known, although *V. edulis* in western United States has been used for food. This plant, with its usually large fleshy roots, is still used in this way by certain Indian tribes of northwestern United States. On his visits with these Indians in the 1820's, David Douglas recorded the following data about *V. edulis (Patrinia ceratophylla)*:

> The roots, during the spring months, are collected by the Indians, baked on heated stones, and used as an article of winter or spring food. From a bitter and seemingly pernicious substance, it is thus converted into a soft and pulpy mass, which has a sweet taste, resembling that of treacle, and is apparently not unwholesome.[21]

The only species with any current commercial use in the United States is *Valeriana officinalis*, and in addition to its medicinal properties, this species is still used in gardens for its ornamental value.

To my knowledge, the indigenous North American species are seldom cultivated, although *V. arizonica* was known to European gardens at least fifty years ago. Several western American species, such as *V. sitchensis* and *V. columbiana*, should tantalize the efforts of gardeners in northern climates to grow them for their neat appearance and large showy flowers. *Valeriana columbiana* is a worthy rock-garden subject, while *V. sitchensis* would succeed well in a woodland or moist perennial border.

Study Material

In the citation of specimens, I have, wherever possible, used the symbols for herbaria as advocated by Lanjouw (in Chron. Bot. 5:143. 1939).

ARIZ—University of Arizona, Tucson.
BH—Bailey Hortorium, Ithaca, N. Y.
BRY—Brigham Young University, Provo, Utah.
G—Boissier Herbarium, Genève.
GG—Barbey-Boissier Herbarium, Genève.
BR—Jardin Botanique de l'État, Bruxelles.
CAS—California Academy of Sciences, San Francisco.
CGE—Botanical Museum and Herbarium, Cambridge, England.
F—Chicago Natural History [Field] Museum, Chicago.
CA—Colorado Agricultural and Mechanical College, Ft. Collins.
D—Delessert Herbarium, Genève.
E—Royal Botanic Garden, Edinburgh.
FI—Istituto Botanico dell'Universita, Firenze.
GT—Gentry Herbarium, Los Angeles.
GH—Gray Herbarium, Cambridge, Mass.
K—Royal Botanic Gardens, Kew.
M—Botanische Staatssammlung, München.
MAT—Matuda Herbarium, Mexico City.
MSC—Michigan State College, East Lansing.

[20] Chem. & Phar. Veg. Drugs. p. 159. 1944.
[21] In Hooker, W. J. Fl. Bor. Am. 1:291. 1834.

MU—University of Michigan, Ann Arbor.
MO—Missouri Botanical Garden, St. Louis.
MIN—University of Minnesota, Minneapolis.
OTB—Division of Botany, Dept. of Agriculture, Ottawa.
OXF—Oxford University, Oxford.
OS—Sherard Herbarium, Oxford University.
NY—New York Botanical Garden.
P—Muséum National d'Histoire Naturelle, Paris.
PO—Pomona College, Claremont, California.
WYO—University of Wyoming, Laramie.
S—Naturhistoriska Riksmuseet, Stockholm.
T—Escuela Agricultura Pan Americana, Tegucigalpa, Honduras.
US—United States National Herbarium, Washington.
UC—University of California, Berkeley.
W—Naturhistorisches Museum, Vienna.
WTC—Washington State College, Pullman.
STR—Institut Botanique de l'Université, Strasbourg.
WILLU—Willamette University, Salem, Oregon.

Acknowledgments

I am indeed very grateful and certainly indebted to the many individuals in the various herbaria from which specimens were either borrowed or studied and for the many courtesies and privileges extended. I wish to express thanks to the Director of the Missouri Botanical Garden, Dr. George T. Moore, for the full use of Garden facilities, and words to the library staff are inadequate as thanks for tireless assistance. I wish to thank Dr. R. E. Woodson, Jr. for his continued counsel and genuine assistance during critical moments in the study. During 1950 visits to several of the larger herbaria in Great Britain and on the continent facilitated the study of many of the older collections not available in American herbaria.

Most of the drawings are from the pen of my wife whose patience and diligent assistance in this way added its full measure to the successful completion of this study. To Ellen Lissant, I extend thanks for her drawings which are included under "Morphology."

The citation of specimens is in accord with the following plan: (a) Alaska and Canada: one collection per locality with the widest herbarium distribution; (b) United States: by states, one specimen per county with the widest herbarium distribution; (c) Mexico, Central America, West Indies: all specimens seen are cited.

Taxonomy

Valeriana [Tourn.] L. Sp. Pl. ed. 1. 31. 1753; Gen. Pl. ed. 5. 19. 1754. DC. Prod. 4:627. 1830; Höck, in Engl. Bot. Jahrb. 3:1–73. 1882. LECTOTYPE = *V. officinalis* L.

Hemesotria Raf. in Ann. Gen. Sci. Phys. 6:88. 1820.
Oligococe Willd. ex DC. Prod. 4:632. 1820, *nomen* in hb. Willd.
Amplophus Raf. Aut. Bot. 89. 1840. (T.: based on *V. scandens* L.).

Herbs, perennial or annual from rhizomes or tap-roots. *Stem* subscapose or leafy, fistulous, terete or occasionally more or less quadrangular. *Leaves* decussate, basal and cauline, spatulate and undivided or pinnate to pinnatifid or rarely bipinnatifid, frequently more or less decurrent on the subpetiolar and more or less clasping-patelliform base, serrate, crenate, dentate, repand, or entire, membranous to firm. *Inflorescence* determinate, either aggregate-dichasial and thyrsioid or cymes compound, dense and more or less scorpioid, bracteate; flowers hermaphroditic, gynodioecious or polygamo-dioecious. *Corolla* infundibuliform, subcampanulate, or rotate, the tube gibbous or straight, usually more or less hairy on the throat, the 5 lobes equal or subequal. *Stamens* 3, rarely 4, adnate on the throat, anthers essentially sessile and included, or filamentous and exserted, alternate with the corolla lobes; anthers 4-loculate, introrse, 2-lobed, the thecae more or less lunate and opposed, the 4 loculae equal in length, or 4-lobed, the anther thecae sulcate, the ventral loculae longer than the dorsal and parallel. *Pistil* inferior, ovary basically 3-carpellate, maturing 1-fertile adaxial carpel, ovule 1, pendulous, anatropous, exalbuminous, ventral raphe united; vestigal abaxial carpels 2. *Style* 1, the stigma 3-lobed, included or exserted. *Fruit* a cypselate achene, adaxial veins 1-median, 2-peripheral, abaxial veins 3, oriented more or less in the median plane. *Calyx* initially involute, later spreading, the sessile limb concrescent and short-patelliform, hyaline and membranaceous, becoming setose in mid-plane, the setae plumose, or the limb short-cupuliform and more or less irregularly toothed or lobed.

Species, 30.

KEY TO THE SERIES[22]

A. Plants rhizomatous or from conical tap-roots. Anthers distinctly 4-lobed, the thecae sulcate with the ventral loculae slightly longer than the dorsal and essentially parallel.

B. Plants from rhizomes or stolons. Leaves mostly pinnate to pinnatifid, petiolate, and the blades of the undivided leaves more or less abruptly expanding. Corolla infundibuliform to subsalverform (essentially rotate in *V. occidentalis* and *V. dioica sylvatica*), the tube gibbous. Achenes smooth, more or less plane adaxially. Flowers hermaphroditic or gynodioecious ..... I. OFFICINALES (p. 390)

BB. Plants from conical tap-roots. Leaves mostly lingulate-spatulate, gradually decurrent to the subpetiolar and clasping base, the cauline frequently pinnate to pinnatifid and more or less decurrent. Corolla essentially rotate. Achenes transversely rugulose or smooth, adaxial ribs relatively prominent. Flowers polygamo-dioecious..... II. EDULES (p. 420)

AA. Plants from napiform to fusiform tap-roots (although usually poorly developed in the annual species), apparently more or less rhizomatous in *V. clematitis*, *domingensis*, and *scandens*. Anthers distinctly 2-lobed, the thecae usually somewhat lunate and opposed, the loculae equal in length.

C. Indument uniformly spreading or nearly wanting. Rhachis of the divided leaves terete (although usually winged in *V. Palmeri*). Corolla gibbous or the tube straight.

D. Stamens exserted. Corolla (1.8–) 2.3–6.0 mm. long.

[22] Dimensions and descriptions of the corolla apply to perfect flowers; unisexual flowers are reduced to approximately half the length of the perfect flowers.

E. Corolla subrotate, the lobes at least equaling or sometimes exceeding the tube length, the throat manifestly clothed with stiffish hairs, rarely only pilosulous within. Leaves divided, the lateral lobes more or less laciniate or palmately 3- to 7-lobed. Achenes with the abaxial ribs usually relatively prominent ..... III. Ceratophyllae (p. 430)

EE. Corolla infundibuliform to campanulate-infundibuliform, the lobes usually not exceeding half the tube length, the throat scattered-pilosulous within. Leaves undivided or pinnate to pinnatifid or bipinnatifid, the lateral lobes broader, crenate to dentate or irregularly cleft to entire. Achenes with the abaxial ribs not prominent.

F. Leaves predominantly undivided or sometimes with 1 pair of lateral lobes. Achenes frequently more or less arcuate, linear- to ovate-oblong, rarely suborbicular, pubescent on the adaxial side or glabrous ..... IV. Clematites (p. 437)

FF. Leaves predominantly pinnate to pinnatifid or bipinnatifid (much reduced and essentially bracteate in *V. vaginata*), prevailingly with more than 1 pair of lateral lobes, rarely undivided. Achenes essentially plane, suborbicular to ovate-oblong, sometimes more or less ovoid, uniformly dense-pilosulous or glabrous ..... V. Densiflorae (p. 448)

DD. Stamens included (slightly exserted in *V. robertianifolia*). Corolla 0.5–3.0 mm. long ..... VI. Sorbifoliae (p. 461)

CC. Indument usually retrorsely disposed on the veins and stems, the leaves ascending-ciliolate. Rhachis of the divided leaves more or less winged. Corolla gibbous towards the middle of the tube ..... VII. Pratenses (p. 479)

Series I. Officinales Höck,[23] in Engl. Bot. Jahrb. 3:41. 1882.

Perennials from rhizomes. *Stem* unbranched to the inflorescence. *Leaves* basal and cauline, elliptic- to obovate-spatulate, pinnate to pinnatifid or sometimes undivided, petiolate, dentate to repand or entire. *Inflorescence* a compound dichasium, more or less flat-topped in anthesis; flowers hermaphroditic or sometimes gynodioecious. *Corolla* infundibuliform to subsalverform or rotate. *Stamens* and style exserted, anthers distinctly 4-lobed, the thecae sulcate with the ventral loculae longer than the dorsal. *Calyx-limb* 9- to 23-fid. Species, 8.

Type Species: *Valeriana officinalis* L.

Series Officinales includes eight closely related species in North America, all north of Mexico. In distribution, the series is circumboreal and includes many of the Valerianas in both Europe and Asia. It stands apart in being the only assemblage of truly rhizomatous Valerianas in North America. The 4-lobed character of the anthers, the usually well-developed pinnate to pinnatifid leaves, and the more or less flat-topped inflorescence are characters which combine to distinguish the species in series Officinales.

KEY TO THE SPECIES

A. Corolla infundibuliform to subsalverform, 3–19 mm. long, the tube distinctly gibbous. Leaves more often ovate to spatulate.

B. Stamens exserted, longer than the corolla lobes. Corolla lobes less than half the tube length. Achenes 2.0–6.5 mm. long.

C. Plants without stolons. Corolla white or pink, 3–9 (–15) mm. long. Achenes unwinged, narrowly to broadly ovate, oblong to oblong-linear.

[23] The epithet for this series was originally used by Höck in the singular number as "Officinalis." The change to plural number is essential under Series designation.

D. Leaves uniformly ascending-ciliate, the terminal lobe linear to elliptic or oblanceolate, 2.0–5.5 cm. long, 0.4–3.0 cm. wide, the lateral lobes sometimes falcate, simulating the terminal lobe. Lateral lobes of the basal leaves 8–12 pairs. Corolla 3–5 mm. long. Achenes 2.5–3.0 mm. long. Adventive from Europe ..... 1. *V. officinalis*

DD. Leaves glabrous or pubescence spreading.

E. Leaves predominantly cauline and ovate or basal and mostly spatulate. Stem sometimes finely pubescent or glabrous. Corolla to 9 mm. long.

F. Plants relatively robust, 3–10 dm. tall. Cauline leaves evidently petiolate, at least the lower, glabrous or essentially so. Alaska, British Columbia, northwestern and northeastern United States ..... 2. *V. sitchensis*

FF. Plants relatively slender, 1–6 dm. tall. Cauline leaves essentially sessile and glabrous or the stem and/or the leaves puberulent. Northwestern Arctic America; western United States ..... 3. *V. capitata*

EE. Leaves predominantly basal and ovate. Stem glabrous. Corolla to 15 mm. long. Southern Colorado, New Mexico, and Arizona ..... 4. *V. arizonica*

CC. Plants with stolons. Corolla blue to pinkish, 13–19 mm. long. Achenes narrowly winged. Southern Illinois, Ohio Valley to Maryland ..... 5. *V. pauciflora*

BB. Stamens included, shorter than the corolla lobes. Corolla lobes 3–6 mm. long, about half the tube length. Achenes 5–7 mm. long. Wenatchee Mountains, Washington ..... 6. *V. columbiana*

AA. Corolla subrotate to rotate, 2.0–3.5 mm. long, the tube indistinctly gibbous or straight. Leaves predominantly oblong.

G. Plants (3–)4.5–9.0 dm. tall, leafy, robust. Achenes linear- to ovate-oblong, sparsely to densely pilosulous, rarely glabrous. North-central Idaho to northern Nevada and northeastern California; southwestern Montana to Colorado ..... 7. *V. occidentalis*

GG. Plants 1.5–3.0(–4.5) dm. tall, slender, somewhat subscapose and considerably less leafy. Achenes ovate to ovate-oblong, glabrous. Northern Rocky Mountains in the United States; northern British Columbia southeastward to Newfoundland ..... 8. *V. dioica sylvatica*

1. VALERIANA OFFICINALIS L. Sp. Pl. 1:31. 1753.

Perennials 5–10 dm. tall, robust, from an abbreviated rhizome, 0.5–1.0 cm. thick, bearing numerous caudical rootlets. *Stem* leafy, 0.5–1.0 cm. in diameter, pilosulous to short-pilose towards the base, glabrescent above, the nodes densely pilosulous. *Leaves* predominantly cauline, 4–5 pairs, petiolate below, becoming sessile above, oblong to oblong-ovate, pinnate to pinnatifid, 9–35 cm. long, glabrous or pilosulous to short-pilose, predominantly on the veins beneath, glabrous above, uniformly ascending-ciliate, the lateral lobes 5–8 pairs, distinct or more or less decurrent on the rhachis, linear to oblanceolate, acute, sometimes more or less falcate, 2.0–7.5 cm. long, 0.4–3.0 cm. wide, the terminal lobe ⅔ as long but as wide as the lateral lobes; basal leaves loosely tufted, 15–30 cm. long, simulating the cauline. *Inflorescence* 2–11 cm. wide in anthesis, later diffuse, 10–18 cm. long, 10–15 cm. wide; bracts 2–3 mm. long, relatively long-ciliate, short-apiculate, the nodes often densely pilosulous; flowers hermaphroditic. *Corolla* infundibuliform, 3–5 mm. long, white, glabrous without, the lobes half as long as the tube, the throat sparsely puberulent towards the base within. *Stamens* and style

exserted. *Achenes* lanceolate- to ovate-oblong, 2.5–3.0 mm. long, glabrous or pilosulous, tawny or rubiginose, abaxial ribs evident. *Calyx-limb* 10- to 12-fid.

TYPE LOCALITY: Europe.

DISTRIBUTION: Introduced into gardens in the United States and Canada. Established as a garden escape from New Brunswick westward to Minnesota and Washington, apparently rarely an escape elsewhere. Flowering and fruiting May through July.

CANADA: NEW BRUNSWICK: Fredericton, *Grob s. n.* (OTB). NOVA SCOTIA: Grand Pré, *Grob s. n.* (OTB); Kings Co., Centreville, *McLellan 718* (OTB). ONTARIO: Carleton Co., Nepean Twp., Brittania, *Cody & Calder 594* (OTB); Frontenac Co., Battersea, *Edmonson s. n.* (NY); Carleton Place, *Grob s. n.* (OTB); Pickering, *Haight s. n.* (OTB); Colborne, Northumberland, *Victorin, Germain, Dominique 46205* (GH, OTB, WYO). QUEBEC: near St. Clements, *Montgomery 999* (OTB); La Malbaie, *Marie-Anselme 165* (OTB); Pontiac Co., Bristol Twp., *Lindsay & Mulligan 135* (OTB); Saint-Mathias, comté de Rouville, *Victorin & Germain 46639* (OTB).

UNITED STATES:

CONNECTICUT: Hartford Co., Southington, *Bissell s. n.* (MO).

MICHIGAN: Cheboygan Co., Mackinaw City, *Dodge s. n.* (MU); Emmet Co., Carp Lake, *Gates 15821* (US); Presque Isle Co., Rogers, *Dodge s. n.* (MU).

MINNESOTA: St. Louis Co., near Morley Park, Duluth, *Lakela 2560* (MO); Winona Co., Winona, *Freiberg s. n.* (MO).

NEW JERSEY: Hudson Co., Hoboken, *Schrenk s. n.* (MO); Hunterdon Co., Califon, *Fisher s. n.* (MO).

NEW YORK: Albany Co.; Tompkins Co., Ithaca, *Rowlee s. n.* (MO); Warren Co., Queensbury, *House 28755* (MO).

VERMONT: Caledonia Co., Peacham, *Blanchard s. n.* (MO); Franklin Co., east Berkshire, *Clausen s. n.* (MO); Windsor Co., Rochester, *Dutton s. n.* (MO).

WASHINGTON: Spokane Co., Newman Lake, *Suksdorf 8792* (WTC).

Valeriana officinalis has been a favorite "old fashioned" garden plant for ages past in Europe, and it has been growing in American gardens for at least 150 years, without doubt since colonial times but a definite record of this is lacking. This species is listed in the United States Pharmaecopoeia as an adulterant in certain cardiac remedies.

2. VALERIANA SITCHENSIS Bong. in Mem. Acad. St. Petersb. 2^6:145. 1833. T.: *Mertens s. n.!* (D, GH, OXF, P, W).

Perennials 3–10 dm. tall, from relatively stout rhizomes 2–7 mm. thick. *Stem* 0.5–1.0 cm. in diameter, glabrescent, the nodes 2–5, densely puberulent or pilosulous. *Leaves* basal and/or cauline; the basal relatively few to many, loosely tufted with the several adventitious shoots, or essentially wanting, petiolate, undivided or pinnate to pinnatifid, ovate to ovate-oblong or suborbicular and more or less cordate, 10–35 cm. long, dentate to repand or entire, glabrous or pilosulous on the veins below, sometimes spreading-ciliate; cauline leaves 2–5 pairs, simulating the basal, pinnate to pinnatifid, 3–20 cm. long, the lateral lobes 1–6 pairs, shorter than the terminal lobe, grading smaller. *Inflorescence* in anthesis 2–8 cm. wide, later diffuse, 10–12 cm. long, 6–9 cm. wide, the nodes pilosulous; bracts 5.0–5.5 mm. long, glabrous or sparsely spreading-ciliate; flowers hermaphroditic or rarely gynodioecious. *Corolla* infundibuliform, 4.5–9.0 mm. long, white to pinkish,

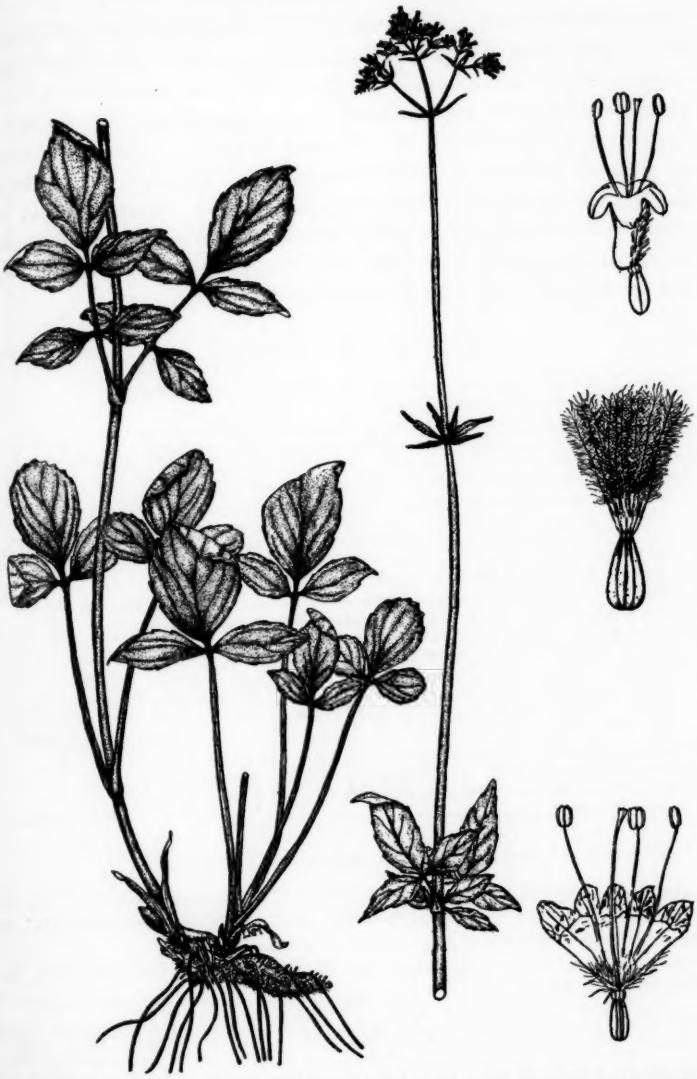

Fig. 4. *Valeriana sitchensis* ssp. *sitchensis*: Habit × ⅓; entire and dissected flowers, and achene (abaxial side), × 5.

glabrous or sometimes pilosulous towards the base of the tube without, the limb less than half as long as the gibbous tube, rarely ½ as long, the throat sparsely to somewhat densely pilosulous within. *Stamens* and style exserted. *Achenes* linear- to ovate-oblong, 3–6 mm. long, glabrous. *Calyx-limb* 11- to 23-fid.

The subalpine and low altitude variants of *Valeriana sitchensis* were recognized as early as 1837 when Shuttleworth in his description of *V. Hookeri* distinguished two distinct taxa under this name—the Rocky Mountain form merely as "in sylvis ad Montes Scopulorum", and the Pacific coast populations as var. *β foliolis subintegeris* from the Columbia River. It is clear, however, that the Rocky Mountain plant conforms to Bongard's earlier description of this plant from Sitka as *V. sitchensis*, which in the present treatment applies to *V. s. sitchensis*. Under var. *β*, however, Shuttleworth clearly delimits, although not by name, *V. sitchensis* ssp. *Scouleri*, as may be easily interpreted from the type specimen. In north-central United States there occurs a third taxon, *V. s. uliginosa*.

KEY TO THE SUBSPECIES

A. Cauline leaves with 1–3 (–4) pairs of lateral lobes, the terminal lobe obovate, ovate-rhombic to suborbicular, acute or obtuse.
  B. Plants robust, to 12 dm. tall. Leaves predominantly cauline, crenate to irregularly repand-dentate to entire or essentially so, firmly membranaceous, glabrous or hirtellous on the veins, the terminal lobe 1.5–6.5 cm. wide. Corolla 4.5–7.0 mm. long, white, frequently pilosulous towards the base of the tube without. Achenes mostly ovate to oblong-ovate, 3–6 mm. long, about 2 mm. wide, tawny to purpurascent, frequently purple-maculate. Subalpine from the Kenai Peninsula and the coastal mountains of Alaska to east-central and southern British Columbia; Idaho and western Montana; Washington to the Siskiyou Mountains, California ..... 2a. *V. s. sitchensis*
  BB. Plants slender, to 7 dm. tall. Leaves predominantly basal, entire or essentially so, thinly membranaceous, glabrous, the terminal lobe 0.9–3.8 cm. wide. Corolla 5–9 mm. long, pinkish-white, glabrous without. Achenes mostly oblong-linear, 5–6 mm. long, 1–2 mm. wide, tawny to rubiginose, rarely purpurascent. Southwestern British Columbia to Mendocino Co., Calif., from sea-level to about 4000 feet altitude, west of the Cascade Mountains ..... 2b. *V. s. Scouleri*
AA. Cauline leaves with (3–)4–6 pairs of lateral lobes, the terminal lobe lanceolate to elliptic, acute to acuminate, 0.9–2.5 cm. wide. Corolla 5–6 mm. long, glabrous without. Michigan to Ohio, New York, north to New Brunswick ..... 2c. *V. s. uliginosa*

2a. VALERIANA SITCHENSIS Bong. ssp. SITCHENSIS.

Valeriana Hookeri Shuttl. in Flora 20[2]:450. 1837. T.: *Drummond s. n.!* (GH, K, NY).
Valeriana capitata Pall. ex Link *β Hookeri* Torr. & Gray, Fl. N. Am. 2:48. 1841, as to specimens cited in part.
Valeriana frigidorum Gdgr. in Bull. Soc. Bot. Fr. 65:37. 1918. T.:*Cusick 1715!* (E, K, MIN, MO, UC, US, WTC).
Valeriana Suksdorfii Gdgr. l. c. 36. 1918. T.: *Suksdorf 6060!* (WTC).
Valeriana anomala Eastw. in Leafl. West. Bot. 3:22. 1941. T.: *Howell 15162!* (CAS).

Perennials 3.5–12.0 dm. tall, robust. *Stem* leafy. *Leaves* predominantly cauline, 10–20 cm. long, pinnate to pinnatifid, the lobes crenate to irregularly repand-dentate or essentially entire, membranaceous, glabrous or occasionally spreading-ciliate to somewhat strongly hirtellous, the terminal lobe obovate, ovate-rhombic to suborbicular, 2.5–4.5 cm. wide, acute or obtuse, the lateral lobes 1–4 pairs; basal leaves petiolate, ovate-elliptic to obovate, 11–40 cm. long, glabrous,

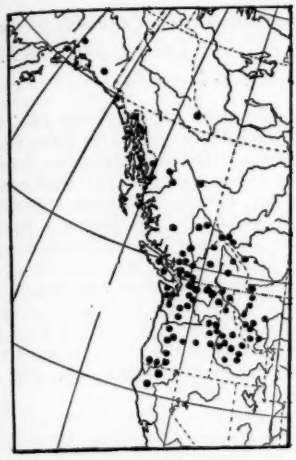

Fig. 5. Distribution of *V. sitchensis* ssp. *sitchensis.*

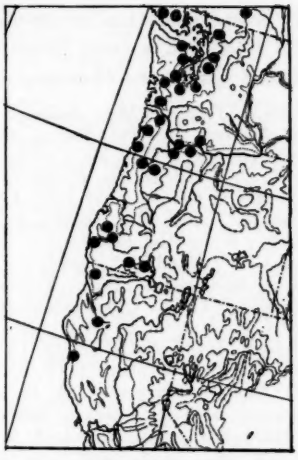

Fig. 6. Distribution of *V. sitchensis* ssp. *Scouleri.*

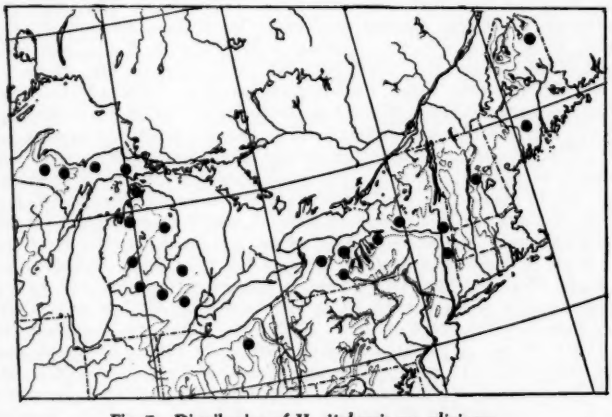

Fig. 7. Distribution of *V. sitchensis* ssp. *uliginosa.*

the terminal lobe 5–10 cm. long, 2–5 cm. wide. *Corolla* 4.5–7.0 mm. long, frequently somewhat pilosulous towards the base of the tube without. *Achenes* ovate to oblong-ovate, 3–6 mm. long, 2.0–2.1 mm. wide, tawny or purpurascent, frequently purple-maculate. *Calyx-limb* 12- to 20-fid.

Type Locality: "Habitat in montanis, l'Isle Sitka" [now Baranof Island], Alaska.

Distribution: Subalpine meadows and open woodlands in the mountains from about 4000 feet altitude (rarely lower) in the southern part and above 1800 feet altitude in the northern part of the range. Kenai Peninsula, southward in the

Alaska coastal mountains to east-central and southern British Columbia to south-central Idaho and western Montana; Washington and Oregon to the Siskiyou Mountains, California. Flowering and fruiting June to September.

ALASKA: Talkeetna Mts., *Anderson R1024* (S); Thompson Pass, *Anderson 1924* (S); Hyder, *Anderson 5572* (S); Juneau, *Anderson 6388* (GH, OTB, S, WYO); Hope, *Anderson 6593* (GH, S, WYO); Mt. Crillon, *Bates 146* (GH); McDonald Lake region, *Burcham 56* (NY, US); Glacier Bay, *Coville & Kearney 764* (US); Egg Island, Disenchantment Bay, *Coville & Kearney 1037* (BM, US); Yakutat Bay, *Coville & Kearney 1159* (US); Chugash Mts., Anchorage, *Dutilly, LePage, O'Neill 20530* (S); Mt. Verstonia, *Emmons s. n.* (US); White Pass, *Enander s. n.* (S); Knight Island, Prince William Sound, *Eyerdam 3521* (MO); Evans Island, *Eyerdam 5953* (OTB); Mtn. #1, Yes Bay, *Gorman 93* (K, NY, US); Montagne Isl., Prince William Sound, *Heller 28* (UC); Short Bay, *Howell 1631* (MIN, MO, NY, UC, US); Seward, *Hultén 7924* (S); Yoho Pass Trail & Hoho Valley, *Longfield & Blezard s. n.* (BM); 20 mi. nw. Hyder, *McCabe 8416* (UC); Deer Mt., Revillagigdeo Island, *McCabe 8619* (UC); Skagway, *Macoun 91475* (NY); Sitka, *Mertens s. n.* (D, GH, K, MO photo, OXF, P, W); Mt. Roberts, Juneau, *Nelson 4430* (GH, US, WYO); Craig, *Norberg s. n.* (S); Ketchikan, *Willett 30* (WTC).

CANADA: ALBERTA: Loggan, *Bolley 10* (WYO); Pipestone Valley, *Brown 429* (GH, US); headwaters of Saskatchewan & Athabasca Rivers, *Brown 1450* (GH); Jasper House, *Burke s. n.* (K); Banff, *Diehl s. n.* (BRY); head of Smoky River, *Hollister 9* (US); Pyramid Peak, near Henry House, *Hollister 59* (US); Lake Louise, *Hunnewell 3845* (GH); Mt. Edith Cavell, *McCabe 8343* (UC); Mt. Paget, *Macoun 65383* (GH, NY); Bertha Lake, Waterton Nat. Park, *Moss 476* (GH, OTB); Jasper, *Moss 2675* (GH); Mt. Quincy, *Osthermer 88* (GH). BRITISH COLUMBIA: Mt. Cheam, *Anderson 814½* (OTB); Mt. Garibaldi, *Bennett s. n.* (E, K); Asulkan Valley, Glacier, *Brown 230* (GH, MO); Burgess Trail, Field, *Brown 375* (GH, MO, NY, US); Cougar Mt., *Butters, Holway, Rosendahl 588* (MIN); Yoho Valley, *Butters & Holway s. n.* (MIN); McGillivray, Crowsnest Pass, *Eastham 15774* (OTB); White Pass, *Eastwood 897* (GH, US); Mission, *Fletcher 814½* (OTB); Yale, *Fletcher 952* (BM); Stanley, *Fraser s. n.* (NY); Summit Lake, *Fyles s. n.* (OTB); Vancouver Island, Forbidden Plateau, *Greig s. n.* (MBG); coast range, Vancouver, *Henry s. n.* (CGE); Falkland, *Hitchcock & Martin 7529* (UC); Moraine Lake, *Hollis 6206* (MO); Moose Pass, *Hollister 101* (US); Sumas, *Lyall s. n.* (K, P); 25 mi. ne. Barkerville, *McCabe 44a* (UC); Bowron Lake rd. near Barkerville, *McCabe 418* (UC); 15 mi. sw. Kleena Kleene, *McCabe 569* (UC); 8 mi. w. Clearwater, *McCabe 2254a* (UC); Grouse Mt., 8 mi. n. Vancouver, *McCabe 2744* (UC); Alta Lake, *McCabe 2942* (UC); 20 mi. sw. Kaslo, *McCabe 4740* (UC); 5 mi. n. Crowsnest Pass, *McCabe 4900* (UC); 1 mi. s. Flathead Summit, *McCabe 4942* (UC); Mt. Revelstoke, *McCabe 5403* (UC); Marble Canyon near Vermilion Pass, *McCabe 6180* (UC); Mt. Whymper, Vermilion Creek, *McCabe 6351* (UC); 20 mi. n. Takla Landing, *McCabe 8083* (UC); 9-Mile Mt., ne. Hazelton, *McCabe 8146* (UC); 15 mi. sw. Telegraph Creek, *McCabe 8900* (UC); between N. Thompson & Bonaparte rivers, *Macoun s. n.* (GH, US); Skagit Valley, between 49° and 49°15′N, and 121° and 121°20′W, *Macoun 72799* (NY); Cassiar Dist., near head Tsetce-yeh River, branch of Klappan River, *Preble & Mixter 646* (US); Mt. Selwyn, about 56°1′N., 123°39′W., *Raup & Abbe 4179* (GH, S); Cameron River Valley, Vancouver Island, *Rosendahl 1990* (CGE, K, MIN, MO); Toquin Valley, Jasper Park, *Sanson 909* (NY); Great Northern Mt., *Scheuber s. n.* (US); Big Bend Dist., about 118°20′W., 51°45′N., *Shaw 933* (GH, MIN, MO, NY, US); Bluster Mt., Marble Mts., *Thompson & Thompson 410* (US); between Mt. Field & Mt. Wapta, *Walcott s. n.* (US); 27 mi. n. Natal, *Weber 2282* (GH, NY, UC). NORTHWEST TERRITORIES: near the Yukon border, about 62°30′N., 129°W., *Goodwin 26* (NY).

UNITED STATES:

CALIFORNIA: Humboldt Co., Trinity Summit, *Tracy 5230* (UC); Siskiyou Co., Marble Mts., *Howell 15162* (CAS, MO photo).

IDAHO: Adams Co., between Meadows and McCall, *Rollins 1144* (GH, MO, NY); Blaine Co., Alturas Lake, *Cronquist 2578* (MO); Boise Co., Quartzburg, *Mulford s. n.* (GH, MO, NY); Bonner Co., Priest River Exp. Station, *Epling 6204* (MO); Clearwater

Co., divide between St. Joe and Clearwater River, *Leiberg 1249* (ARIZ, GH, K, MO, NY, UC, US, WYO); Custer Co., 25 mi. nw. Stanley, *Cronquist 2772* (MO); Elmore Co., 20 mi. n. Pine, *Meyer & Meyer 2359* (MO); Idaho Co., Hibbs Cow Camp, Dry Diggins, T23N, R2W, *Packard 335* (UC); Kootenai Co., Wiessner's Peak, *Sandberg, MacDougal, Heller 587* (BM, CA, D, GH, K, MO, NY, US); Lemhi Co., Mt. Baldy, Salmon, *Payson & Payson 1848* (GH, MO, NY, WYO); Shoshone Co., Forks of St. Mary's River, *Leiberg 1335* (ARIZ, GH, MO, NY, UC, US, WYO); Valley Co., Sawtooth Mts., *Thompson 13793* (D, GH, MO, NY, UC, US); Washington Co., Cuddy Mts., *Jones s. n.* (PO).

MONTANA: Beaverhead Co., Bitter Root Range, 3 mi. above O'Neill's Sawmill, *Hitchcock & Muhlick 12645* (GH, MO, S, UC, WYO); Clark Co., Helena, *Starz s. n.* (MO); Deerlodge Co., Anaconda Mts., shore of Storm Lake, *Hitchcock & Muhlick 14865* (MO); Flathead Co., Columbian Mt., *Rogers & Rogers 1164* (MO, NY); Glacier National Park, *Osterhout s. n.* (MO); Granite Co., 2 mi. w. Skalkaho rd. summit, *Hitchcock & Muhlick 14484* (MO, UC); Lake Co., Mission Range, se. McDonald Lake, *Hitchcock 18281* (UC); Madison Co., Tobacco Mts., *Hitchcock 17048* (WTC); Meahger Co., Little Belt Mts., *Flodman 804* (MIN, MO, NY, US); Missoula Co., Flathead Range, near Upper Holland Lake, *Hitchcock 18440* (UC); Powell Co., Gordon Mt., 6 mi. s. Big Prairie Ranger Station, *Hitchcock 18842* (UC).

OREGON: Baker Co., Anthony Lake, Blue Mts., *Maguire & Holmgren 26915* (NY, UC, US); Crater Lake National Park, *Heller 12956* (D, GH, MO, NY, UC, US); Crook Co., along a brook, *Whited 648* (GH, K, MO, NY); Grant Co., Strawberry Mt., *Henderson 5688* (GH, MO); Hood River Co., Elk River, Mt. Hood, *Benson 2540* (MO, NY, US); Jackson Co., Huckleberry Mt., *Coville & Applegate 371* (NY, US); Jefferson Co., 4 mi. s. Mt. Jefferson, *Nelson 2813* (GH); Josephine Co., Siskiyou Mts., *Whittaker 55100* (WTC); Klamath Co., Union Peak, *Applegate 4770* (WILLU); Lane Co., McKenzie Pass, 5 mi. w. summit, *Peck 9799* (GH, MO, WILLU); Marion Co., Jefferson Park, T10S, R8E, Sec. 11, *Peters 179* (MO); Umatilla Co., near Langdon Lake, *Peck 22281* (WILLU); Union Co., Wenaha National Forest, Bone Springs, *Lawrence 208* (ARIZ, US); Wallowa Co., Buckhorn Springs, *Peck 18315* (WILLU).

WASHINGTON: Asotin Co., Blue Mts., near Big Butte, 9 mi. se. Anatone, *Meyer 414* (MO); Chelan Co., Mt. Stuart, *Whited 774* (US); Clallam Co., Deer Lake, *Meyer 1042* (MO); Columbia Co., Blue Mts., Goodman Springs, *Constance, Clarke, Staats, Van Vleet 1163* (MIN, MO, P, WYO); Ferry Co., Graves Lookout, R35E, T36N, *Boner & Weldert 234* (GH, MO, NY, UC, WYO); Garfield Co., Stentz Spring, T9N, R42E, *Constance & Clements 1735* (MO); Grays Harbor Co., trail to Mt. Colonel Bob, *Meyer 999* (GH, MO); Jefferson Co., Constance Ridge, *Meyer 710* (MO); Kittitas Co., Table Mt., *Meyer & Meyer 2234* (MO); Mason Co., Mt. Ellinor, *Eyerdam 1262* (BM, D, MO); Okanogan Co., Big Craggy, *Thompson 10851* (MO, NY); Pend Oreille Co., Pass Creek Pass, *Laskey s. n.* (WTC); Pierce Co., Chinook Pass, *Eyerdam s. n.* (MO); Mt. Rainier National Park, Paradise Valley, *Meyer & Meyer 2240* (MO); Skagit Co., Mt. Baker Forest, *Neff 506* (WTC); Skamania Co., Mt. St. Helens, *Coville 762* (US); Snohomish Co., alpine meadows of Mt. Dickerman, *Thompson 8875* (MO); Spokane Co., Mica Peak, *Suksdorf 8817* (WTC); Thurston Co., Black Hills, *Meyer 1637* (GH, MO, OTB); Walla Walla Co., Blue Mts., *Piper s. n.* (WTC); Whatcom Co., Mt. Baker Lodge, *Heller 14751* (D, MO, NY, US); Yakima Co., Mt. Adams, *Suksdorf 6060* (WTC).

Shuttleworth quite adequately recognized in his original description of *V. Hookeri* two categories which are in the present treatment recognized as subspecies under *V. sitchensis*. The synoptial chart below reveals the salient characters that distinguish these taxa:

V. s. sitchensis	*V. s. Scouleri*
HABITAT: subalpine, on relatively deep soil in meadows, open or sometimes dense coniferous woods; flowering in summer.	low altitude, 0–4000 ft., on basalt bluffs along streams; flowering in spring.
HABIT: robust, 3.5–12.0 dm. tall.	slender, 3.5–7.0 dm. tall.
LEAVES: predominantly cauline, crenate to irregularly repand-dentate.	predominantly basal, entire or essentially so.
ACHENES: ovate to oblong-ovate.	oblong-linear.

Valeriana s. sitchensis is one of the conspicuous and quite attractive subalpine plants, especially in the Olympic and Cascade mountains of Washington state where it is commonly referred to as "Mountain Heliotrope".

2b. VALERIANA SITCHENSIS Bong. ssp. **Scouleri** (Rydb.) F. G. Mey., stat nov.

Valeriana Hookeri var. β Shuttl. in Flora 20[2]:450. 1837. T.: *Scouler s. n.!* (E, NY).
Valeriana capitata Pall. ex Link β *Hookeri* Torr. & Gray, Fl. N. Am. 2:48. 1841. T.: *Douglas s. n.!* (BM, K).
Valeriana Scouleri Rydb. in Mem. N. Y. Bot. Gard. 1:377. 1900. T.: based on *V. Hookeri* var. β Shuttl.
Valeriana sitchensis Scouleri (Rydb.) Piper, in Contr. U. S. Nat. Herb. 11:533. 1906.
Valeriana Adamsiana Eastw. in Leafl. West. Bot. 2:196. 1939. T.: *Eastwood & Howell 1334!* (CAS).
Valeriana Follettiana Eastw. *l. c.* 197. 1937. T.: *Follett s. n.!* (CAS).
Valeriana humboldtiana Eastw. *l. c.* 198. 1939. T.: *Eastwood & Howell 4868!* (CAS).

Perennials 3.5–7.0 dm. tall, slender. *Stem* sparsely leafy. *Leaves* predominantly basal, 3–10 cm. long, pinnate to pinnatifid or undivided, the lobes entire or essentially so, thinly membranaceous, glabrous, the terminal lobe of the divided leaves and blade of the undivided leaves obovate, ovate-rhombic to suborbicular, 0.9–3.0 cm. wide, the lateral lobes 2–5 pairs. *Corolla* 5.0–8.8 mm. long, glabrous without. *Achenes* oblong-linear, 5–6 mm. long, 0.9–1.8 mm. wide, tawny to rubiginose, rarely purplish. *Calyx-limb* 12- to 18-fid.

TYPE LOCALITY: "On moist rock and islands of the Columbia River near Oak Point".

DISTRIBUTION: Sea-level to about 4000 feet altitude on bluffs along forest streams west of the Cascade Mts. from southwestern British Columbia to Mendocino Co., Calif. Flowering and fruiting March to July.

CANADA: BRITISH COLUMBIA: between Alexandra Bridge and Yale, *McCabe 2504* (UC); Doyle Island, Gordon Channel, *McCabe 7122* (UC); Yale, *Macoun s. n.* (NY); Chilliwack Valley, 49°–49°10′N., 121°25′–122°W., *Macoun 64902* (NY); Skagit Valley, 49°–49°15′N., 121°–121°20′W., *Macoun 72796* (NY); Vancouver Island, vicinity of Nanaimo, *Macoun 88005* (NY); Vancouver Island, vicinity of Ucleulet, Mr. Fraser's garden, *Macoun 88006* (NY); exposed cliffs along Cameron Lake, Vancouver Island, *Meyer & Meyer 2246* (MO); Vancouver Island, Sookes River area, *Nelson & Nelson 716* (MO, WYO); banks of Gordon River, Vancouver Island, *Rosendahl & Brand s. n.* (MIN); Port Renfrew, Vancouver Island, *Rosendahl 1744* (MIN); Fraser River Canyon near Yale, *Thompson & Thompson 10* (MO, NY, UC, US).

UNITED STATES:

CALIFORNIA: Del Norte Co., Mary Adams Peacock Bridge, along Smith River, *Eastwood & Howell 1334* (CAS); Humboldt Co., 5 mi. e. Berry Summit, *Eastwood & Howell 4868* (CAS); Mendocino Co., along the creek at Elk, *Follett s. n.* (CAS).

OREGON: Columbia Co., rocky bluffs below Clatskanie, *Thompson 2450* (MO); Clackamas Co., Clackamas Lake, *Peck 15850* (WILLU); Coos Co., Middle Fork Coquille River, *Detling 4087* (UC); Curry Co., shady bank of Rogue River near Gold Beach, *Peck 8695* (WILLU); Douglas Co., west fork Cow Creek Canyon, *Peck 7424* (WILLU); Hood River Co., Cascades, *Harford & Dunn 359* (MO); Jackson Co., Rogue River, Wood-

ville, *Peck 7423* (WILLU); Josephine Co., woods near Savage Rapids, 6 mi. from Grants Pass, *Henderson 6058* (MO, WYO); Lane Co., Castle Rock Trail, *Detling 2818* (UC); Lincoln Co., cliff above the sea, Otter Crest, *Peck 16333* (UC, WILLU); Linn Co., Willamette watershed, *Cusick 4545* (WTC); Multnomah Co., Warrendale, *Thompson 11870* (MO, NY); Polk Co., Mill Creek, 4 mi. sw. Buell, *Peck 16221* (WILLU); Tillamook Co., Tillamook, *Ferguson s. n.* (WILLU).

WASHINGTON: Clallam Co., lower slopes of Mt. Angeles, *Thompson 7574* (GH, K, MO, UC); Grays Harbor Co., Montesano, *Heller & Heller 3937* (E, GG, GH, MO, NY, P, US); Jefferson Co., moist woods along Dosewallops River, *Thompson 6551* (K, MO, NY, US); King Co., Green River Cañon, *Mosier s. n.* (US); Klickitat Co., Larm River, *Suksdorf s. n.* (BM, D, E, GH, MO, P, US); Mason Co., Hoodsport, *Otis 2359* (WTC); Pierce Co., Eatonville, *Flett 2204* (WTC); Skamania Co., Chenowith, *Suksdorf 1658* (WTC); Snohomish Co., Perry Creek Trail, *Thompson 14526* (GH, MIN, MO, NY, S, UC, US); Thurston Co., Tumwater, *Townsend s. n.* (MO, UC, WTC); Wahkiakum Co., Skamokawa, *St. John 8748* (GH, MO, UC); Whatcom Co., trail from Glacier to Mt. Baker, *Mason 3894* (UC).

The subspecies *Scouleri* is a low-altitude forest plant of the moist Pacific coastal climate west of the Cascade Mountains from British Columbia to northern California where it prefers Middle Tertiary basalt or sedimentary bluff habitats principally along forest streams from the sea-coast to the foot-hills of the Cascades. These specialized habitats occur, for the most part, locally throughout the distribution of the subspecies. The facies of these bluffs consist of masses of bare-faced or sparsely wooded rock cliffs, with a thin soil cover and accompanying conditions of reduced water supply—semi-drought in mid-summer. Under these specially provided conditions these bluffs support a characteristic "bluff flora" where they afford special means for isolation and may be alluded to as islands within the coniferous belt throughout the area where this plant occurs. Although the distribution of *V. s. sitchensis* lies within the realm of *V. s. Scouleri* west of the Cascade Mountains, these taxa remain effectively isolated from each other by marked habitat and altitudinal discontinuities. The ecological barriers effectively isolate these subspecies so that interbreeding between them can be virtually ruled out; differences in flowering time increase the difficulty in this respect. At least I have seen no material that would suggest hybridization between these taxa.

2c. VALERIANA SITCHENSIS Bong. ssp. **uliginosa** (Torr. & Gray) F. G. Mey., stat. nov.

Valeriana sylvatica β uliginosa Torr. & Gray, Fl. N. Am. 2:47. 1841. T.: *Sartwell s. n.!* (BM, GH, NY).
Valeriana uliginosa (Torr. & Gray) Rydb. ex Britton, Man. 878. 1901.
Valeriana dubiosa Gdgr. in Bull. Soc. Bot. Fr. 65:37. 1918. T.: *Beal s. n.*

Perennials 3–10 dm. tall, relatively slender. *Stem* leafy. *Leaves* predominantly cauline, pinnate to pinnatifid, 5.5–21.0 cm. long, the lobes dentate to repand or entire, membranaceous, spreading-ciliate, glabrous or sparsely pilosulous below, the terminal lobe lanceolate to elliptic, acute to acuminate, 0.9–2.5 cm. wide, the lateral lobes 5–6 pairs; basal leaves 20–35 cm. long, petiolate, undivided or with 1 pair of lateral lobes, ovate-elliptic to obovate, dentate to repand or entire, the blades and terminal lobe of the divided leaves 6.5–14.5 cm. long, 3.5–6.0 cm.

wide. *Corolla* 5–6 mm. long, glabrous without. *Achenes* lanceolate, elliptic to ovate-oblong, 3–4 mm. long, glabrous. *Calyx-limb* (11-)15- to 23-fid.

TYPE LOCALITY: Lake Ontario, Wayne Co., N. Y.

DISTRIBUTION: Marshy meadows, swamps, and bogs, Michigan, northern Ohio, New York and adjoining Canada, northward to Vermont and New Brunswick. Flowering and fruiting end of May through August.

CANADA: NEW BRUNSWICK: Gloucester Co., Petit Rocher, *Blake 5502* (GH, K, NY, P, US); Restigouche Co., Dalhousie, *Turesson & Alm 175* (S). ONTARIO: Proton, *Quinn s. n.* (OTB). QUEBEC: Bonaventure Co., New Richmond, *Chrysler 1264* (US); Rimouski Co., Bic, *Forbes s. n.* (GH, WYO); St. Fabren, *Williamson 1376* (NY); Lower Canada, Somerset, *Brunet s. n.* (GH).

UNITED STATES:

MAINE: Aroostook Co., Perham, *Steinmetz 782* (US); Penobscot Co., Staceyville, *Allard 7210* (GH, US).

MICHIGAN: Charlevoix Co., ne. Clarion, *McVaugh 9409* (MU); Chippewa Co., Eckerman, *Dodge s. n.* (MU); Eaton Co., Olivet, *herb. Coville* (US); Emmet Co., Carp Lake, *Gates 15431* (US); Genesee Co., Flint, *Trench s. n.* (MU); Ionia Co., Hubbardston, *Wheeler s. n.* (GH, MSC, US); Kent Co., Grand Rapids, *Sones s. n.* (MU); Jackson Co., Jackson, *Dodge s. n.* (MU); Lapeer Co., Lang Lake, *Dodge s. n.* (MU); Livingston Co., Whitmore Lake, *Ehlers 4747* (US); Luce Co., Lake Manistique, *Hermann 8303* (MU, NY); Mackinac Co., Naubinway, *McVaugh 10928* (MU); Marquette Co., Negaunee, *Rydberg s. n.* (NY); Montcalm Co., Cedar Lake, *Davis s. n.* (MU); Oakland Co., n. Pontiac, *Chandler s. n.* (MSC, US); Otsego Co., 5 mi. e. Vanderbilt, *McVaugh 10890* (MU); Schoolcraft Co., near Seul Choix, *Pease & Bean 26347* (GH); Washtenaw Co., Dexter, *Hermann 9455* (GH, US).

NEW YORK: Columbia Co., Ancram, *McVaugh 3118* (GH); Dutchess Co., Pine Plains, *Hoysradt s. n.* (GH, NY, UC, US); Genesee Co., Bergen Swamp, near Byron, *Johnson 4078* (US); Herkimer Co., Jordanville, *Haberer 402* (GH, K, MO, NY); Madison Co., Syracuse, *Sheldon 1144* (NY); Monroe Co., Mendon, *Metcalf 8872* (GH); Wayne Co., Butler, *Wiegand & Wright 7208* (GH); Yates Co., *Sartwell s. n.* (BM, GH, NY).

OHIO: Stark Co., Canton, *Steele 2* (MO, US).

VERMONT: Fairhaven, *Eggleston 1275* (BM, K, MIN, MO, NY, P).

Subspecies *uliginosa* prefers wet meadows and swampy areas in the deciduous forest regions north of the southern extent of Pleistocene glaciation. The broad (about 1200 miles) discontinuity that separates ssp. *sitchensis* and ssp. *uliginosa* may be likened to the distributions of other species in Hultén[24], such as *Scheuchzeria palustris, Festuca rubra, Equisetum scirpoides,* and *Gnaphalium uliginosum* among others. Hultén attempts to outline a history of the modern distribution of these species on the assumption that the pre-Pleistocene distribution was continuous and by the onset of the Wisconsin phase of the Pleistocene epoch the distributions became disjunct. Thus, many widely distributed species were left as remnants of the former distribution as modern inhabitants in western and eastern North America. Hultén essentially accepts the view that refuge areas existed within the glaciated regions of northeastern United States; or perhaps these species existed to the south of the glaciated areas and moved northward in post-glacial times. Modern glacial geologists do not give very much support to the refugia concept, and Flint[25] does not locate any large refuge areas in north-

[24] Outline of the History of Arctic and Boreal Biota during the Quartenary Period. p. 123. 1937.
[25] Glacial Geology and the Pleistocene Epoch. 1947.

eastern United States. The modern distribution of *V. s. uliginosa* is entirely within glaciated areas. Perhaps *V. s. uliginosa* sought its way to northeastern United States and adjoining Canada from western America contemporaneously with the final stages of Wisconsin glaciation.

Subspecies *uliginosa* and *sitchensis* may be distinguished as follows:

V. s. uliginosa	*V. s. sitchensis*
Cauline leaves with (3–)4–6 pairs of lateral lobes; terminal lobe lanceolate to elliptic, acute to acuminate.	Cauline leaves with 1–3(–4) pairs of lateral lobes; terminal lobe obovate, ovate-rhombic to suborbicular, acute or obtuse.

3. VALERIANA CAPITATA Pallas, ex Link, Jahrb. d. Gewächsk. 1[3]:66. 1820. T.: *Pallas 789* (in hb. Willd., photo in hb. MO).

Perennials 1–6 dm. tall, from slender to relatively stout rhizomes 1–6 mm. thick. *Stem* leafy to more or less subscapose, 1–6 mm. thick, glabrous to uniformly pilosulous, the nodes consistently pilosulous. *Leaves* forming a loosely tufted rosette with the several adventitious shoots at the base, or obsolete, undivided, ovate to obovate-spatulate, 2–20 cm. long, 0.6–3.0 cm. wide, acute or obtuse, irregularly dentate to entire or essentially so, glabrous to puberulent; cauline leaves 3–5 pairs, undivided or pinnate to pinnatifid, ovate- to oblong-oblanceolate or obovate-spatulate, the uppermost much reduced, becoming bract-like, the blades and terminal lobe of the divided leaves ovate to elliptic or suborbicular, 1–5 cm. long, 1.0–2.6 cm. wide, acute to obtuse, the lateral lobes 1–5 pairs, less than half as long as the terminal lobe, grading smaller, the petioles to 4 cm. long, grading shorter to nearly obsolete, more often spreading-ciliate towards the base. *Inflorescence* dense in anthesis, 1.5–5.0 cm. wide, later diffuse, 3–14 cm. long, 3–9 cm. wide, nodes and internodes pilosulous or glabrous; bracts glabrous to sparsely spreading-ciliate; flowers hermaphroditic. *Corolla* infundibuliform, 3–8 mm. long, white to pinkish, glabrous to pilosulous without, the lobes half as long as the gibbous tube, the throat sparsely pilosulous within. *Stamens* and style longer than the corolla limb. *Achenes* ovate, oblong to oblong-linear, 3.0–6.5 mm. long, glabrous or pilosulous, smooth, tawny, rubiginose, or purpurascent, often purple-maculate, abaxial ribs evident. *Calyx-limb* 10–17-fid.

The modern distribution of *Valeriana capitata* is marked by a series of discontinuous distributions. With this as a basis, I have recognized four subspecies in the present interpretation of *V. capitata*, with *V. c. capitata* in the Arctic north of 60°, and three subspecies in western United States, *V. c. acutiloba*, *californica*, and *pubicarpa*.

Hultén in his critical work on Arctic plants lists certain species in western America with disjunct distributions essentially like *V. capitata*. He mentions *Anemone Drummondii*, *Potentilla rubricaulis*, *Thlaspi alpestre purpurescens*, and *Carex nudata* in this category. An explanation is sought by suggesting for these species a former continuous distribution which extended from unglaciated areas, particularly in northern and central Alaska, through western Canada to areas in western United States that fall south of the maximum effect of Pleistocene glaci-

ation. The present disjunct distribution is thought to have been brought about during the maximum thrust of the continental ice mass which completely covered western Canada. Flint's[26] map offers further evidence that during the maximum extent of glaciation in western Canada the Pleistocene ice field engulfed the whole of western Canada with the exception of the extreme northwest. The present distribution of *V. capitata* coincides adequately with geological data.

KEY TO THE SUBSPECIES

A. Leaves glabrous, predominantly ovate and cauline, frequently more or less acuminate, irregularly dentate or toothed. Basal leaves few, mostly from lateral offshoots. Rhizome slender, 1–3 mm. thick, rarely branched. Kodiak Island, Unalaska, islands of the Bering Sea; interior Alaska to the Yukon Territory north of 60°; also in Arctic Asia to the Kola Peninsula, Scandinavia ..... 3a. *V. c. capitata*

AA. Leaves puberulent or glabrous, predominantly spatulate (sometimes ovate in *V. c. pubicarpa*), basal and cauline. Rhizome stouter, 3–7 mm. thick, often much branched.

B. Whole plant or the stem only puberulent. Leaves more often broadly ovate- to obovate-spatulate or sometimes ovate, obtuse, approximately half as broad as long. Lateral lobes of the divided leaves 1–4 pairs.

C. Plants short-puberulent to glabrescent. Undivided leaves and terminal lobe of the divided leaves more often truncate or retuse, regularly 3- to 7-toothed or entire. Achenes 4.0–6.5 mm. long. Southern Oregon and the Sierra Nevada mountains of California to Tulare Co.; also in adjoining Nevada ..... 3b. *V. c. californica*

CC. Stem puberulent, leaves essentially glabrous. Undivided leaves and terminal lobes mostly entire. Achenes 3.5–5.5 mm. long. Southwestern Montana, western Wyoming, central Idaho to northern Utah; southeastern Oregon to the Charleston Mountains, Nevada ..... 3c. *V. c. pubicarpa*

BB. Whole plant essentially glabrous. Leaves more often oblanceolate-spatulate, twice to several times as long as broad, acute to more or less apiculate. Lateral lobes of the divided leaves 2–5 pairs, much reduced, long-acuminate ..... 3d. *V. c. acutiloba*

3a. VALERIANA CAPITATA Pall. ex Link ssp. CAPITATA.

Valeriana bracteosa Britt. in Bull. N. Y. Bot. Gard. 2:183. 1901, *non* Philippi. T.: *Williams s. n.!* (NY).

Valeriana capitata Pall. ex Link var. *bracteosa* (Britt.) Hult. Fl. Alaska & Yukon, pt. 9:1453. 1949.

Perennial 1–6 dm. tall. *Rhizome* slender, 1–3 mm. thick. *Stem* glabrous or pilosulous towards the base, glabrescent above. *Leaves* predominantly cauline, 3.0–5.5 cm. long, 1.3–5.0 cm. wide, ovate to obovate, acuminate, the lowermost pair more often undivided, petiolate or subsessile, obtuse, pinnate above, sessile or subsessile, lateral lobes 1–2 pairs, usually much reduced, sharply and irregularly dentate or essentially entire, glabrous, the terminal lobe ovate to suborbicular, 1.5–6.0 cm. long, 1.0–2.6 cm. wide, the lateral lobes less than twice as small, grading smaller; petiole 0.5–1.5 cm. long or nearly obsolete. *Inflorescence* 1.5–3.5 cm. wide in anthesis, subglobose; bracts exserted midst the flowers and fruits,

[26] Flint, R. F. l. c. p. 23.

filiform to linear, glabrous, usually purpurascent. *Corolla* 5–7 mm. long, glabrous without. *Achenes* ovate- to elliptic-oblong, 3–4 mm. long, 1.5–2.5 mm. wide, glabrous, rubiginose or purpurascent. *Calyx-limb* 12- to 15-fid.

TYPE LOCALITY: "vom hochsten Gipfel der Sajanischen Alpen."

I was unable to locate the Sajanischen Alpen on Pallas's maps[27] to his 'Reise', but the name "Sajan Mountains" still exists for a mountain range separating Tannu Tuva and Siberia in lat. 52–54°N., long. 100°E.

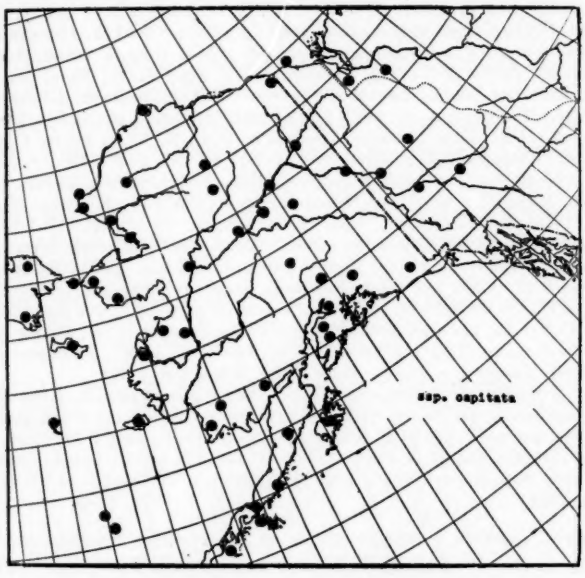

Fig. 8. Distribution of *V. capitata* ssp. *capitata*.

DISTRIBUTION: Tundra in the extreme north and in woods in the southern part of the range. Islands of the Bering Sea and the whole of Alaska, except the outer Aleutian Islands and southeastern Alaska; Yukon Territory to the Mackenzie River and north of 60°. This plant occurs across Arctic Asia to the Kola Peninsula, Scandinavia. Flowering and fruiting June to August.

ALASKA: Tofty, *Adeney s. n.* (BM); Humboldt Harbor, *Albatross Exp. s. n.* (US); Herendeen Bay, *Albatross Exp. s. n.* (US); Fairbanks, *Anderson* (NY); Ft. St. Michaels, *Bannister s. n.* (GH, US); Kodiak Island, *Bean s. n.* (US); Agiapok River, *Bird s.n.* (NY); Cape Nome, *Blaisdell s. n.* (GH, NY); between Cook Inlet and Rampart City, *Brooks & Prindle s. n.* (US); Teller, *Campbell 71* (US); St. Lawrence Island, *Chambers 35* (US); Upper Matanuska Valley, *Chaney 90* (MO); Anvik, *Chapman 65* (GH, NY); York,

[27] Reise durch verschiedene Russischen Reiche. St. Petersburg. 1771.

Seward Peninsula, *Coats 1* (US); Chunik, Seward Peninsula, *Collier s. n.* (US); Eagle, *Collier 37* (US); Nunivak Island, *Collins s. n.* (US); Port Clarence, *Coville & Kearney 1900* (US); Hall Island, *Coville & Kearney 2029* (US); Mt. McKinley National Park, *Dixon 57* (UC, US); Glen road, mile 124, *Dutilly, LePage, O'Neill 20423* (OTB); so. Anchorage, *Dutilly, LePage, O'Neill 20727* (OTB); White River valley, *Eaton s. n.* (US); Ladue Valley, *Eaton s. n.* (US); no. Mt. St. Elias, *Eaton 40* (US); Kussiloff, *Evans 631* (US); Fox Bay, *Evermann s. n.* (US); St. Paul Island, *Evermann 84* (US); St. George Island, *Evermann 101* (US); King Cove, Alaska Pen., *Eyerdam 1730* (BM, K, NY); Coal Creek Hill, Yukon River, *Funston 98* (US); Nelson Island, *Gabrielson s. n.* (GH); St. Matthew, *Gabrielson s. n.* (GH); Kenai Lake, *Gabrielson s. n.* (GH); Unga, *Golder 87* (US); Iliamna River, *Gorman 37* (P, US); Katmai Region, *Hagelbarger 77* (US); Goodnews Bay, *Harrington 34* (US); Slrumagin Island, *Harrington s. n.* (MO); Ft. Gibbon, *Heideman 31* (US); Copper Center, *Heideman 84* (US); Koyukuk, *Hilsman s. n.* (US); Karluk, *Horne s. n.* (NY); Seward, *Hutchison 86* (BM); Unimak Island, *Hutchison 333* (BM); Wiseman, *Jordal 2078* (US); Bettles, *Jordal 2454* (US); Popof Island, *Kincaid s. n.* (US); Kotzebue Sound, *Lay & Collie s. n.* (BM); McGrath, *Layden 16* (US); Norton Sound, *MacGregor s. n.* (UC); Nushagak, *McKay s. n.* (US); Kowak River, *McLevegan s. n.* (US); Cape Lisburne, *Mason s. n.* (GH, K, UC); Beaver City, *Mendenhall s. n.* (US); Sheenjek Valley, *Mertie s. n.* (US); 65°–65°30′N., 141°–142°W., *Mertie 119* (US); 59°–60°N., 158°–159°W., *Mertie 199* (US); Pastolik, *Miller 79-C* (US); Point Barrow, *Murdock s. n.* (US); Nelson Island, *Palmer 183* (US); Ft. Hamlin, *Piper s. n.* (US); 141st Meridian, 3 mi. from Arctic Ocean, *Pope 3* (US); Little Diomede Island, *Porsild 1719* (GH, US); between Point Barrow and Mackenzie River, *Pullen s. n.* (CGE); Rampart, *Rader 83* (US); Yukon Delta, *Russell s. n.* (US); Kuskokwim Basin, *Sargent & Smith 17* (US); 109 mi. n. Fairbanks, *Scamman 3609* (GH); Kotzebue, *Scamman 4073* (GH); Glen Highway, mile 128, *Scamman 4560* (GH); Upper Chignik Lake, *Schmitt 44* (US); St. Michael, *Setchell s. n.* (UC); Putnam River, *Stoney s. n.* (US); Piels River, *Taylor s. n.* (US); 68°50′–69°15′N., 160°–161°10′W., *Thompson s. n.* (US); Porcupine River, *Turner s. n.* (UC); Point Hope, *White s. n.* (US).

CANADA: NORTHWEST TERRITORIES: Arctic Red River, Taklovik, *Gates & Mellenby s. n.* (K); MacPherson, *Smith 103* (K). YUKON TERRITORY: King Point, *Anderson s. n.* (NY); Dawson, *Eastwood 315* (GH, UC, US); Moosehide, *Eastwood 488* (GH, UC, US); 63°57′N., 135°10′W., *Gillett & Calder 4324* (OTB); Herschell Island, *Lindström s. n.* (NY); Colorado Pup, *Macoun 91474* (NY); Ft. Selkirk, *Tarleton 101a* (NY); Dawson, *Williams s. n.* (NY).

Valeriana c. capitata is wholly arctic or subarctic in distribution, occurring in the most northerly latitudes of any member of the genus. This taxon may be readily distinguished by its nearly sessile leaves, comparatively slender habit, and showy white flowers. Its distribution includes the whole of Arctic Asia, but in North America I have seen no material from the glaciated region east of the Mackenzie River delta, although it is apparently quite common over the whole of Arctic Alaska. This subspecies is separated by a geographical discontinuity of nearly 1500 miles from *V. capitata* in western United States where the history of the intermediate area is most intimately associated with Pleistocene glaciation. No collections of *V. capitata* from the intermediate area are known at this time.

3b. VALERIANA CAPITATA Pall. ex Link ssp. **californica** (Heller) F. G. Mey., stat. nov.

Valeriana californica Heller, in Muhlenbergia 1:60. 1904. T.: *Heller 7156!* (BM, D, E, GH, K, MO, NY, P, S, UC, US).

Valeriana puberula Piper, in Smiths. Miscel. Coll. 50:202. 1907. T.: *Coville & Applegate 340!* (GH, MO, US).

Valeriana seminuda Piper, in Proc. Biol. Soc. Wash. 37:95. 1924. T.: *Coville & Funston 1486!* (K, NY, US).

Valeriana sylvatica Banks var. *glabra* Jepson, Man. Fl. Pl. Calif. 970. 1925. T.: *Culbertson 4376!* (GH, K, MO, NY, UC).

Valeriana Whiltonae Eastw. in Leafl. West. Bot. 3:24. 1941. T.: *Winblad s. n.!* (CAS).

Perennials 2–6 dm. tall. *Rhizome* relatively stout, 3–7 mm. thick. *Stem* uniformly puberulent to pilosulous towards the base, glabrescent above. *Leaves* predominantly basal, usually forming a rather loosely tufted rosette with the adventitious offshoots, mostly undivided or pinnate to pinnatifid, oblanceolate- to obovate-spatulate, 4.5–15.0 cm. long, 0.8–2.5 cm. wide, truncate or retuse at the tip, frequently 3- to 7-toothed or essentially entire, acute, firmly membranaceous, uniformly puberulent, or merely ciliate or glabrous, the lateral lobes of the divided leaves 1–4 pairs; cauline leaves petiolate, pinnate to pinnatifid, 2.5–8.0 cm. long, rarely simple; petioles (1.5–)2–4 cm. long. *Inflorescence* 1.5–2.5 cm. wide in anthesis; bracts sometimes sparsely ciliate. *Corolla* 3.0–5.5 mm. long, glabrous or sometimes pilosulous towards the base of the tube without. *Achenes* elliptic to ovate-oblong, 4.0–6.5 mm. long, 2.0–2.8 mm. wide, glabrous or pilosulous. *Calyx-limb* 12- to 17-fid.

Type Locality: "Ridge south of Donner Pass at 8500 ft., August 12, 1903", Nevada Co., Calif.

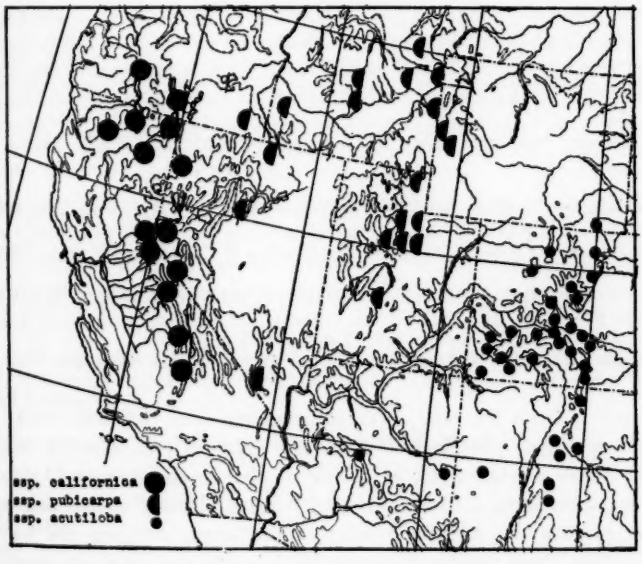

Fig. 9. Distribution of the subspecies of *V. capitata* in western United States.

DISTRIBUTION: Subalpine slopes, meadows, and along creek banks, also in coniferous woods, 5000–10400 ft. alt. Southern Oregon and the Sierra Nevada Mts. of California to Tulare Co.; also in adjoining Nevada. Flowering and fruiting June to August.

UNITED STATES:
CALIFORNIA: Alpine Co., *Hansen 725* (BM, D, GG, K, MO, NY, P, US); Butte Co., Jonesville, *Copeland 481* (ARIZ, BM, D, GH, K, MIN, MO, NY, P, UC, US, W); Eldorado Co., Echo Summit Pass, *Robbins 1228* (US); Fresno Co., Dinkey Creek, *Hall & Chandler 413* (E, GH, K, MIN, MO, NY, UC, US); Humboldt Co., Salmon Summit, *Tracy 14381* (UC); Modoc Co., n. end Warner Mts., *Alexander & Kellogg 4850* (UC, US); Mono Co., Tioga Grade, *Winblad s. n.* (CAS, MO photo); Nevada Co., Donner Pass, *Heller 7156* (BM, D, E, GH, K, MIN, MO, NY, P, S, UC, US); Placer Co., Mt. Lincoln, *Heller 12928* (D, GH, MO, NY, UC, US); Shasta Co., Lassens Peak, *Austin 499* (US); Sierra Co., Sierraville, *Nordstrom 927* (UC); Siskiyou Co., Mt. Eddy, *Heller 12079* (D, GH, MO, NY, US); Tulare Co., between Mineral King and Farewell Gap, *Coville & Funston 1486* (K, MO photo, NY, US); Tuolumne Co., Bridgeport, *Hawbecker s.n.* (UC); Yosemite National Park, *Schreiber 1874* (UC).
NEVADA: Douglas Co., Spooner, *Baker 1146* (D, GH, MO, NY, UC, US, W); Ormsby Co., Marlette Lake, *Train 3281* (NY, UC); Washoe Co., so. Slide Mountain, *Heller 10920* (GH, MO, NY, UC, US).
OREGON: Crater Lake National Park, *Coville & Applegate 340* (GH, MO, US); Jackson Co., Siskiyou Mts., *Whittaker 259* (WTC); Lake Co., Crane Mt., *Thompson 13235* (MO, NY, UC, WILLU).

Plants of the subspecies *californica* are usually puberulent throughout, with leaves usually obovate-truncate to retuse and frequently 3- to 7-toothed. These characters, along with the geographical discontinuity, sharply distinguish the Sierran subspecies, and the Californian populations might well be maintained under full specific rank, but to do this would obscure the natural relationships of the Californian, the Rocky Mountain, and the Arctic elements of *V. capitata*.

3c. VALERIANA CAPITATA Pall. ex Link ssp. **pubicarpa** (Rydb.) F. G. Mey., stat. nov.

Valeriana pubicarpa Rydb. in Bull. Torr. Bot. Club 36:697. 1909. T.: *Rydberg & Carlton 7717!* (NY, US, WYO).
Valeriana puberulenta Rydb. *l. c.* 1909. T.: *Rydberg & Carlton 7065!* (GH, MIN, NY, US).
Valeriana Cusickii Gdgr. in Bull. Soc. Bot. Fr. 65:36. 1918. T.: *Cusick 2131!* (D, E, GH, K, MIN, MO, P, UC, US, WTC).
Valeriana utahensis Gdgr. *l. c.* 37. 1918. T.: *Linford s. n.*,
Valeriana maculata Eastw. in Leafl. West. Bot. 3:23. 1941. T.: *Alexander 6106!* (CAS, UC).

Perennials 1.5–5.4 dm. tall. *Rhizome* relatively stout, 2–6 mm. thick. *Stem* puberulent to densely pilosulous or glabrescent. *Leaves* predominantly basal, undivided or rarely divided, ovate or oblong to obovate-spatulate, 3–21 cm. long, 0.6–3.0 cm. wide, acute or obtuse, essentially entire, glabrous or sometimes spreading-ciliate towards the subpetiolar base; cauline leaves petiolate, the lowermost undivided those above pinnate to pinnatifid, 4.2–10.0 cm. long, the lateral lobes 1–3 pairs, lanceolate to elliptic, to 8 mm. wide; petioles about 0.4–3.0 cm. long. *Inflorescence* 1.5–5.0 cm. wide in anthesis; bracts glabrous, sometimes purpur-

ascent. *Corolla* 4–7 mm. long, the tube mostly pilosulous, rarely glabrous without. *Achenes* linear- to lanceolate-oblong, 3.5–5.5 mm. long, 1.5–2.0 mm. wide, pilosulous or glabrous, frequently purple-maculate. *Calyx-limb* 11- to 17-fid.

TYPE LOCALITY: Mount Nebo, Utah. August 15, 1905.

DISTRIBUTION: On limestone granitic soils, stony sagebrush slopes or beneath pines and on talus slopes in the mountains, 6200–11800 ft. alt. Southwestern Montana, western Wyoming, central Idaho to northern Utah; southeastern Oregon to the Charleston Mts., Nevada. Flowering and fruiting June to August.

COLORADO: Hohus Peak, *Tweedy 4555* (NY, US).

IDAHO: Blaine Co., Lost River Mts., *Macbride & Payson 3154* (GH, MO, NY, US, WYO); Bonneville Co., Caribou Mt., *Payson & Armstrong 3512* (GH, MO, WYO); Clark Co., Kilgore, *Cronquist 1428* (MO); Custer Co., Mackay, *Nelson & Macbride 1495* (GH, MIN, MO, WYO); Fremont Co., Henry Lake, *Payson & Payson 1988* (GH, MO, NY, WYO); Lemhi Co., Eighteenmile Peak, *Davis 1094* (UC); Owyhee Co., Silver City, *Macbride 932* (D, E, GH, MIN, MO, NY, UC, US, WYO).

MONTANA: Beaverhead Co., Lima, *Rydberg 2794* (NY); Madison Co., Midway Station, *Nelson & Nelson 5455* (MO, NY).

NEVADA: Clark Co., Charleston Mts., Lee Canyon, *Clokey 7734* (ARIZ, BM, BRY, CA, GH, MAT, MIN, MO, NY, OTB, US); Elko Co., Jarbridge, *Nelson & Macbride 1946* (GH, MIN, MO, NY, S, US, WYO); Esmeralda Co., David Davis Ranch, *Shockley 518* (GH); Eureka Co., Eureka, *Train 255* (US); Lander Co., Toiyabe Range, *Kennedy 4182* (MO); Nye Co., Toiyabe Range, *Maguire & Holmgren 25976* (ARIZ, GH, NY, UC, US); White Pine Co., Ruby Range, *Hitchcock & Martin 5662* (NY, UC, US).

OREGON: Crook Co., Ochoco Forest, *Peck 17181* (WILLU); Harney Co., Steens Mts., *Cusick 2131* (D, E, GH, K, MIN, MO, P, UC, US, WTC).

UTAH: Cache Co., w. ridge Spring Hollow, *Maguire 13803* (GH, NY); Juab Co., Deep Creek Range, *Holmgren 37446* (NY); Piute Co., Marysvale, *Rydberg & Carlton 7065* (GH, MIN, NY, US); Salt Lake Co., Sunset Mts., *Maguire 17441* (NY); Utah Co., Mt. Timpanogos, *Harrison 9358* (MO); Wasatch Co., Provo, *Goodding 1148* (D, GG, GH, MO, NY, P, UC, US, WYO).

WYOMING: Lincoln Co., Afton, *Payson & Armstrong 3339* (GH, MO, WYO); Sublette Co., Gros Ventre Mts., *Payson & Payson 3026* (GH, MO, NY, UC, US, WYO); Teton Co., Teton Pass, *Hall 11469* (UC).

Valeriana c. pubicarpa may be distinguished by its uniformly puberulent stem and predominantly entire and glabrous leaves. It is confined to the mountains of the Great Basin of the intermountain region west of the Continental Divide. On its western perimeter ssp. *pubicarpa* nearly makes contact with *V. c. californica*, and the following variant bears mention:

(Syn. *V. maculata* Eastw. in Leafl. West. Bot. 3:23. 1941). Plants depauperate, 1.5–2.5 dm. tall; leaves mostly undivided, 3.5–9.0 cm. long, 0.6–1.1 cm. wide, Charleston Mts. and Toiyabe Range, Nevada.

3d. VALERIANA CAPITATA Pall. ex Link ssp. **acutiloba** (Rydb.) F. G. Mey., stat. nov.

Valeriana acutiloba Rydb. in Bull. Torr. Bot. Club 28:24. 1901. T.: *Rydberg & Vreeland 5576!* (NY).

Valeriana Crandallii Gdgr. in Bull. Soc. Bot. Fr. 65:36. 1918. T.: *Crandall 2080!* (CA, MO photo, NY, US, WYO).

Valeriana glacialis Gdgr. *l. c.* 1918. T.: *Crandall s. n.! = n. 2076* (CA, NY, US).

Perennials 1.5–6.0 dm. tall. *Rhizome* relatively stout, 2–4 mm. thick. *Stem* glabrous or glabrescent. *Leaves* predominantly basal, more often numerous and forming a rather loosely tufted rosette, undivided or rarely divided, predominantly oblong-, oblanceolate- to obovate-spatulate, 3.5–36.0 cm. long, 1.2–2.3 cm. wide, short-acuminate or acute to more or less apiculate, glabrous or sometimes spreading-ciliate towards the subpetiolar base; cauline leaves essentially sessile, pinnate to pinnatifid, the lowermost sometimes undivided, 1.5–7.0(–12) cm. long, the lateral lobes 2–5 pairs, linear to oblong-linear, grading smaller, becoming more or less filiform, 1–3 mm. wide, petioles obscure. *Inflorescence* 1.5–3.5 cm. wide in anthesis; bracts glabrous. *Corolla* 4–8 mm. long, glabrous or sometimes pilosulous towards the base of the tube without. *Achenes* ovate to oblong-lanceolate, 2.5–5.0 mm. long, 1.5–2.0 mm. wide, glabrous, frequently purple-maculate. *Calyx-limb* 10- to 14-fid.

TYPE LOCALITY: COLORADO: Near Gray-Back Mining camps and Placer Gulch, Sangre de Cristo Range, Custer Co., 2600–2800 m. alt. June 25–27, 1900.

DISTRIBUTION: Wet meadows, open woods, along stream sides, grassy and rocky slopes, 8000–13000 ft. alt. Southeastern Wyoming, Colorado, New Mexico and Arizona. Flowering and fruiting May to August.

ARIZONA: Apache Co., White Mts., *Phillips & Phillips 3269* (ARIZ); Coconino Co., San Francisco Mts., *Peebles & Smith 13596* (NY, US).

COLORADO: Boulder Co., Fourth July Valley, *Ewan 12154* (UC); Chaffee Co., 5 mi. above St. Elmo, *Rollins 1371* (D, GH, MO, NY); Clear Creek Co., Brookvale, *Churchill s. n.* (GH, MO); Costilla Co., near Veta Pass, *Rydberg & Vreeland 5575* (NY); El Paso Co., Pikes Peak road, *Wiegand & Upton 4345* (MO); Fremont Co., Sierra Sangre de Cristo, *Brandegee 790* (NY, UC); Garfield Co., near Trappers Lake, *Hanna 1422* (MO); Gilpin Co., James Peak, *Cox 302* (MO); Gunnison Co., Carson, *Baker 313* (D, E, GH, MIN, MO, US); Lake Co., Mt. Elbert, *Clokey 3581* (GH, MO, NY, S, UC, US, WYO); Mineral Co., Rio Grande National Forest, *Murdock 4618* (MO, NY, UC, US); Montezuma Co., Mt. Hesperus, *Baker, Earle & Tracy 258* (BM, D, E, GH, K, MIN, MO, NY, US, W, WYO); Park Co., Eleven-Mile Canyon, *Killip 36411* (MO, US); Routt Co., Anita Peak, *Goodding 1760* (E, GH, MO, NY, US, WYO); San Juan Co., Silverton, *Crandall 2080* (CA, MO photo, NY, US, WYO); Summit Co., Breckenridge, *Brandegee 192* (MO, NY, UC).

NEW MEXICO: Catron Co., 18 mi. e. Mogollon, *Meyer & Meyer 2201* (MO); county unknown, Pecos Baldy, *Bailey 569* (US); county unknown, Pecos River National Forest, *Standley 4182* (US).

WYOMING: Albany Co., Laramie Mts., *Porter 1062* (MO).

Valeriana c. acutiloba is most easily distinguished by its leaves, which are oblong-, oblanceolate- to obovate-spatulate, short-acuminate or acute to apiculate. This is the only subspecies of *V. capitata* in which lanceolate leaves predominate. Leaf shape, which basically offers the best character for subspecies differentiation in *V. capitata*, is summarized as follows:

V. c. capitata	*V. c. pubicarpa*	*V. c. californica*	*V. c. acutiloba*
Ovate to obovate	Ovate or oblong to obovate-spatulate	Obovate- or oblanceolate-spatulate	Oblong- to oblanceolate-spatulate

4. VALERIANA ARIZONICA Gray, in Proc. Am. Acad. 19:81. 1884. T.: *Palmer s.n.!* (GH, MO).

Valeriana ovata Rydb. in Bull. Torr. Bot. Club 31:645. 1904. T.: *Clements & Clements 241!* (E, GH, MIN, MO, NY, OXF, US, WYO).
Valeriana acutiloba Rydb. var. *ovata* (Rydb.) A. Nels. Man. Bot. 476. 1909.

Perennials 1–3 dm. tall, from rather slender rhizomes 1–4 mm. thick. *Stem* 2–5 mm. in diameter, glabrous, the nodes puberulent. *Leaves* predominantly basal, forming a loosely tufted rosette with the several adventitious shoots, petiolate, undivided or sometimes pinnate, ovate to suborbicular, rarely subcordate, 2.5–17.0 cm. long, entire or essentially so, glabrous, acute or obtuse, the blades and terminal lobe of the divided leaves 0.8–6.5 cm. long, 1.5–3.0 cm. wide, the lateral lobes 1–3 pairs, distinct, grading smaller, the petioles 1.5–5.5 cm. long; cauline leaves 2–3 pairs, pinnate to pinnatifid, 2.0–4.6 cm. long, sessile, the uppermost much reduced, the terminal lobe elliptic, oblanceolate to obovate, acute to subobtuse, 1.2–3.2 cm. long, 0.9–1.9 cm. wide, the lateral lobes 1–3 pairs, grading smaller. *Inflorescence* dense in anthesis, 2.5–3.0 cm. wide, later expanding to about 5 cm. wide; bracts 5–7 mm. long, glabrous; flowers hermaphroditic or rarely gynodioecious. *Corolla* infundibuliform, 5–15 mm. long, white to pinkish, glabrous without, the tube gibbous, the lobes 2.0–2.5 mm. long, the throat sparsely pilosulous towards the base within. *Stamens* and style exserted. *Achenes* ovate to oblong-lanceolate, 2–5 mm. long, glabrous, tawny or purpurascent. *Calyx-limb* 10–12-fid.

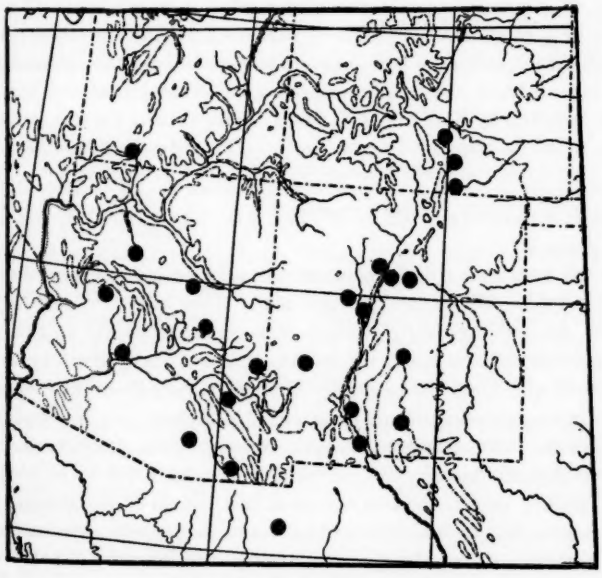

Fig. 10. Distribution of *V. arizonica.*

TYPE LOCALITY: Mountains near Prescott, Arizona. April 20, 1876.

DISTRIBUTION: Dry rocky ravines or shady damp banks in the mountains, 5400–9000 ft. alt. Southern Colorado, New Mexico to Arizona; also in northern Chihuahua, Mexico.

UNITED STATES:

ARIZONA: Cochise Co., Chiricahua Mts., *Goodman & Hitchcock 1183* (MO, NY, WYO); Coconino Co., San Francisco Mts., *Purpus 7056* (UC, US); Gila Co., Matzatzal Mts., *Collom 257* (ARIZ, E, GH, MO, NY, US); Graham Co., Graham Mts., *Wiegand & Wiegand 2264* (GH); Greenlee Co., 35 mi. n. Clifton, *Maguire, Richards, Moeller 11891* (GH, NY); Maricopa Co., mts. near Phoenix, *Norville s. n.* (MO); Navajo Co., between Carrizo and Showlow, *Foster & Arnold 280* (GH, MO, US); Pima Co., Santa Catalina Mts., *Shreve 5428* (ARIZ, GH, UC); Yavapai Co., Prescott, *Palmer s. n.* (GH, MO).

COLORADO: Fremont Co., between Cañon City and Cripple Creek, *Wiegand & Wiegand 2265* (GH); Huerfano Co., Cameron's Cone, *Clements & Clements 241* (E, GH, MIN, MO, NY, OXF, US, WYO); Las Animas Co., Stonewall, *Johnston 826* (GH, WYO).

NEW MEXICO: Catron Co., Mogollon Mts., *Meyer & Meyer 2201 p. p.* (MO); Colfax Co., Raton, *St. John s. n.* (GH); Dona Ana Co., Organ Mts., *Wooton s. n.* (US); Grant Co., 5 mi. n. Pinos Altos, *McVaugh 8054* (MU); Hidalgo Co., Animas Mts., *McVaugh 8093* (MU); Lincoln Co., Eagle Creek, *Wooton s. n.* (US); Otero Co., Ruidosa, *Hinckley s. n.* (GH); Sandoval Co., Pueblo Canyon near Los Alamos School, *Eggleston 20049* (NY); Sante Fé Co., Santa Fé, *Heller & Heller 3613* (BM, E, GG, GH, K, MIN, MO, NY, P, US); San Miguel Co., Pecos Valley, *Eggleston 19998* (GH, MO, NY, US); Sierra Co., Kingston, *Metcalfe 1589* (MO); Socorro Co., Mogollon Mts., *Wooton s. n.* (US); Valencia Co., San Mateo Mts., *Herrick 532* (US).

MEXICO: CHIHUAHUA: Sierra Madre, *Townsend & Barber s. n.* (US).

Valeriana arizonica may be distinguished essentially on the basis of the ovate leaves and the deep pink corolla which may attain a length up to 15 mm. This species has been much confused with *V. capitata acutiloba*, but these taxa may be consistently distinguished by leaf shape. The populations of *V. arizonica* in Colorado and New Mexico consistently maintain a corolla length of 5–8 mm., and this form was described by Rydberg as *V. ovata*. This variant also occurs in Arizona, but there it has corollas 11–15 mm. long. This form includes the type of *V. arizonica*.

5. VALERIANA PAUCIFLORA Michx. Fl. Bor. Am. 1:18. 1803. T.: *Michaux s. n.*! (MO photo, P).

Perennials 5–10 dm. tall, from an abbreviated rhizome 2–5 mm. thick; stolons 2–3, radiating from the caudex, 3–7 dm. long. *Stem* leafy, 2–5 mm. in diameter, glabrescent, the nodes sparsely pilosulous. *Leaves* predominantly cauline, 4–6 pairs, petiolate towards the base, sessile towards the inflorescence, pinnate, ovate to ovate-cordate, 5–18 cm. long, the segments crenate- to serrate-dentate to repand or essentially entire, spreading-ciliate or scattered-pilosulous, the terminal lobe ovate to suborbicular, short-acuminate, cuneate to subcordate, 1.5–5.5 cm. wide, the lateral lobes distinct, more or less rhombic, 1–4 pairs, 1.8–5.5 cm. long, 0.7–2.7 cm. wide, grading smaller towards the internodes; leaves of the stolons undivided, ovate-cordate or pinnate and obovate, 2–25 cm. long, crenate-dentate, sometimes scattered-pilosulous or merely spreading-ciliate. *Inflorescence* 2.5–5.0 cm. wide in anthesis, later diffuse, 3–10 cm. long, 4–6 cm. wide, the nodes densely tufted-

pilosulous; bracts 5–7 mm. long, relatively long spreading-ciliate; flowers hermaphroditic. *Corolla* subsalverform, 13–19 mm. long, more or less filiform towards the base of the tube, bluish-pink, glabrous without, the tube gibbous, the limb 2.0–2.5 mm. long, the throat sparsely pilosulous within. *Stamens* and style exserted. *Achenes* elliptic to ovate-oblong, about 5 mm. long, 2.0–2.5 mm. wide, tawny, sparsely pilosulous on the midveins, the margins narrow-winged, abaxial ribs evident. *Calyx-limb* 14- to 15-fid.

TYPE LOCALITY: "in montosis nemoralis Tennessee prope Flinn-Creek. Junio florens".

DISTRIBUTION: Moist rich woods along streams and in river flats in alluvial soil or rich wooded hillsides. Southern Illinois eastward to the Ohio Valley, Kentucky, Tennessee, Pennsylvania, Virginia, and Maryland. Flowering and fruiting April to June.

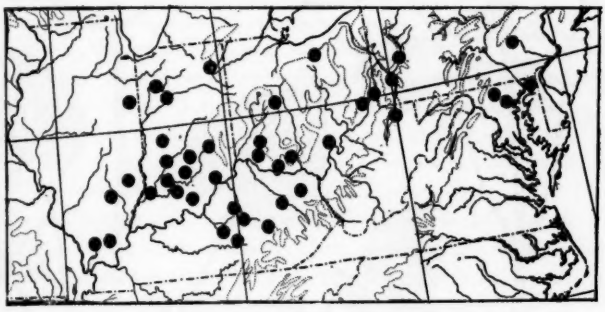

Fig. 11. Distribution of *V. pauciflora.*

UNITED STATES:

DISTRICT OF COLUMBIA: banks of the Potomac, *Morong s. n.* (MO).

ILLINOIS: Johnson Co., Tunnel Hill, *Palmer 15158* (MO); Richland Co., *Ridgway 1598* (MO, US); Union Co., *Meyer 2171* (MO); Vermillion Co., Danville, *Gleason s. n.* (D, GH); Wayne Co., *Hilgard s. n.* (MO).

INDIANA: Allen Co., St. Mary's River, *Deam 1017* (E, MIN); Decatur Co., Greensburg, *Grover s. n.* (MIN); Jefferson Co., Madison, *Barnes s. n.* (GH); Knox Co., Vincennes, *Ridgway 731* (GH, K, P); Lawrence Co., Oolitic, *Shinners 1572* (UC, WYO); Marion Co., Brendonwood, *Friesner 18852.2* (GH, UC); Montgomery Co., Crawfordsville, *Evans s. n.* (MIN); Morgan Co., Bradford Farm, *Wynn 20* (MIN); Orange Co., Orangeville, *Deam 43180* (MIN); Putnam Co., Bainbridge, *Dawson 1261* (MIN); Tippecanoe Co., 5 mi. n. Soldier's Home, Lafayette, *Hermann 6075* (MIN); Warren Co., Independence, *Deam 53807* (MIN).

KENTUCKY: Carter Co., Tygart's River, *Gilbert 964* (GH); Hardin Co., Fort Knox, *Wadmond 7337* (MIN); Laurel Co., Mershons, *McFarland 88* (GH, MIN, MO, UC, US); Mammoth Cave National Park, *Lix 212* (US); Meade Co., Tioga Springs, *Curry s. n.* (GH); Powell Co., Natural Bridge, *Anderson 113* (GH); Warren Co., Barren River, *Price* [*drawing*] (MO).

MARYLAND: Cecil Co., Octoraro Station, *Tatnall 4515* (GH); Montgomery Co., Glen Echo, *Painter 1331* (MO, WYO).

OHIO: Belmont Co., Barnesville, *Laughlin 967* (GH); Champaign Co., Urbana, *collector unknown* (MO); Clermont Co., Loveland, *James s. n.* (NY, UC); Hamilton Co.,

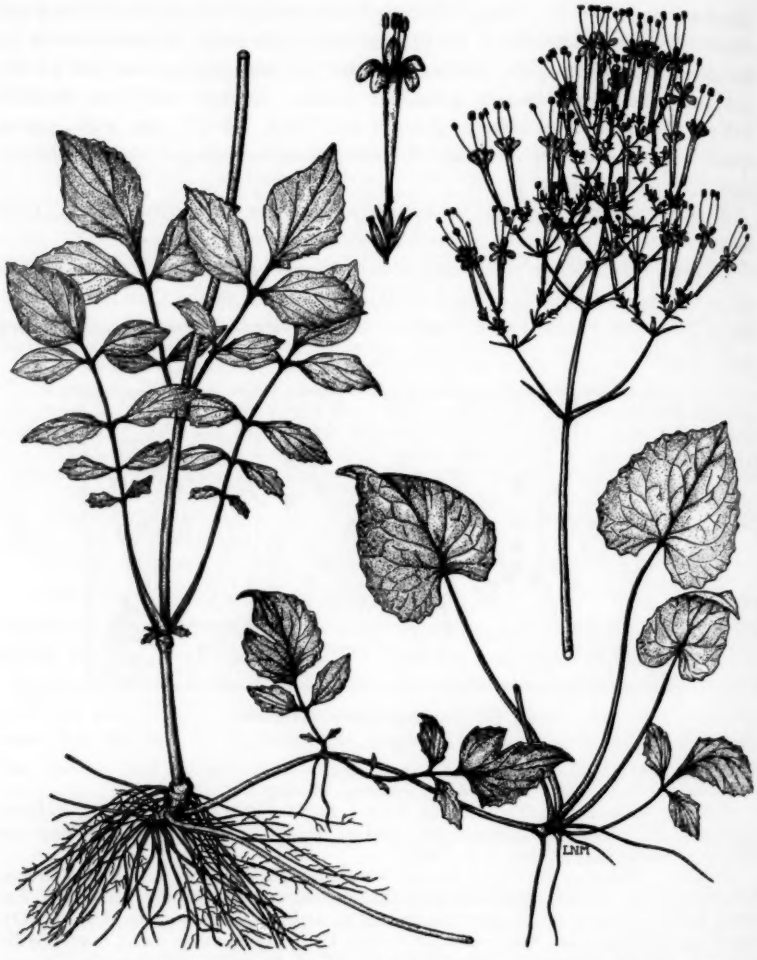

Fig. 12. *Valeriana pauciflora:* Habit, × ⅓; inflorescence, × ⅞; single flower, × 1½.

Cincinnati, *Lloyd s. n.* (FI, GH, MO, NY, P, W); Lorain Co., Oberlin, *Dick s. n.* (GH); Meigs Co., *Jones s. n.* (NY); Scioto Co., Otway, *Demaree 10646* (GH, MIN, MO, UC, US).

PENNSYLVANIA: Allegheny Co., Aspinwall, *Booth & Shafer 1901* (UC, US); Lancaster Co., Millersville, *Heller s. n.* (D, E, GH, MIN, MO, P, US); Washington Co., New Eagle, *Bright 18598* (UC).

VIRGINIA: Fairfax Co., Scott's Run, *Maxon 6321* (US); Loudoun Co., Short Hill, *Freeman s. n.* (US).

WEST VIRGINIA: Monongalia Co., Morgantown, *Myers s. n.* (MIN, NY, UC); Ohio Co., Wheeling, *Mertz s. n.* (US).

Valeriana pauciflora is the only blue-flowered stoloniferous Valeriana in North America, and the corolla is the longest, 13–19 mm., of any of the North American species. In general habit and leaf shape, *V. pauciflora* manifests closest affinities with *V. sitchensis*. The modern distribution of *V. pauciflora* lies over a relatively broad east-west contour from southern Illinois to Maryland where the populations occur more or less locally at rather widely separated localities. However, the mode of variation does not suggest subspecific differentiation, the populations as a whole remaining quite homogeneous. Curiously, I have seen no modern material of this species from Tennessee, although Michaux first collected it in that state at the end of the 18th century.

6. VALERIANA COLUMBIANA Piper, in Bot. Gaz. 22:489. 1896. T.: *Whited 140!* (US).

Perennials 0.8–3.0 dm. tall, from stout rhizomes 3–7 mm. thick. *Stem* leafy, 2–4 mm. in diameter, uniformly puberulent below, glabrescent above. *Leaves* basal and cauline; the basal imbricate, forming a loosely tufted rosette with the several adventitious shoots, petiolate, undivided, broadly ovate to ovate-oblong or sometimes suborbicular, 6–15 cm. long, irregularly dentate, sinuolate to entire or essentially so, glabrous or the veins sometimes pilosulous, the blades 2.5–5.5 cm. long, 1.3–3.6 cm. wide, obtuse, the petioles 2.0–6.5 cm. long, spreading-ciliate towards the base or uniformly pilosulous; cauline leaves 1–4 pairs, 4–12 cm. long, the lowermost petiolate, the uppermost sessile and much reduced, pinnate to pinnatifid, acute, irregularly repand-dentate or essentially entire, the terminal lobe oblong to oblanceolate or obovate, 2.2–6.2 cm. long, 1.1–2.7 cm. wide, occasionally 3-lobed, the lateral lobes 1–2 pairs, sometimes equalling the terminal lobe in length or grading smaller. *Inflorescence* 3–6 cm. wide in anthesis, corymbose, later diffuse, 7.5–15.0 cm. long, 5.5–10.0 cm. wide, internodes sometimes sparsely pilosulous; bracts 8–10 mm. long, glabrous, reduced above; flowers hermaphroditic. *Corolla* infundibuliform to subsalverform, 11–18 mm. long, white, glabrous without, the tube gibbous, the lobes 3–6 mm. long, the throat densely pilosulous especially towards the base within. *Stamens* and style shorter than the corolla lobes. *Achenes* oblong-linear, 5–7 mm. long, 1.5–2.0 mm. wide, tawny, smooth, sometimes purple-maculate, abaxial ribs meagre. *Calyx-limb* 11- to 16-fid.

TYPE LOCALITY: "Side hill above Farwell's house west of Wenatchee [Washington], June 9, 1896[23]."

DISTRIBUTION: Open to forested rocky slopes in the mountains, 2500–6000 ft. alt. Flowering and fruiting May to July.

UNITED STATES: WASHINGTON: Chelan Co., Lookout Mt. near Leavenworth, *Thompson 6530* (GH, MO); Kittitas Co., Table Mt., *Thompson 9273* (MO, NY); Okanogan Co., Little Slate Creek, branch Twisp River, *Edwards 278* (WTC).

Fig. 13. *Valeriana columbiana:* Habit, × 2/5; flower and achene, × 10.

Valeriana columbiana is an endemic species to the Wenatchee Mountains of north-central Washington, and is distinguished by the large, showy, corolla. This is the only North American species in series OFFICINALES with stamens shorter than the corolla lobes. It is most closely related to *V. sitchensis.*

7. VALERIANA OCCIDENTALIS Heller, in Bull. Torr. Bot. Club 25:269. 1898. T.: *Heller 3353!* (D, E, GG, G, MIN, MO, NY, P, UC, US, WTC).

Valeriana micrantha E. Nels. in Erythea 7:166. 1899. T.: *Nelson 793!* (E, GH, MIN, MO, NY, US, WYO).

Perennials (3–)4.5–9.0 dm. tall, relatively robust, from stoutish rhizomes, 3–6 mm. thick. *Stem* 3–6 mm. in diameter, glabrous or glabrescent, the nodes consistently white tufted-pilosulous. *Leaves* at the base forming a loosely tufted rosette with the several adventitious shoots, petiolate, undivided or pinnate to pinnatifid, oblong to narrowly ovate or more or less spatulate, rarely suborbicular, 12–30 cm. long, petiolate, entire or essentially so, glabrous, the blades and terminal lobe of the divided leaves 2–10 cm. long, 1.3–6.0 cm. wide, short-acuminate or obtuse, the lateral lobes 1–2 pairs, grading smaller; petiole 1–1½ times the blade length, spreading-ciliate towards the base, sometimes spreading to the blade and lateral lobes; cauline leaves 2–4 pairs, the lowermost short-petiolate, pinnate to pinnatifid or sometimes undivided, 4.5–14.5 cm. long, the uppermost much reduced and sessile, the terminal lobe oblong-linear, ovate to obovate, 1.9–6.8 cm. long, 0.9–4.0 cm. wide, acute or obtuse, the lateral lobes 1–6 pairs, grading smaller. *Inflorescence* 3.5–5.0 cm. wide in anthesis, later diffuse, 8–60 cm. long, 4.5–15.0 cm. wide, nodes pilosulous, internodes glabrous or sometimes scattered-pilosulous; bracts 5–6 mm. long, glabrous; flowers gynodioecious. *Corolla* rotate to subrotate, 3.0–3.5 mm. long, white, glabrous without, the throat scattered-pilosulous within. *Stamens* and style exserted. *Achenes* linear- to ovate-oblong, 3–5 mm. long, 1–2

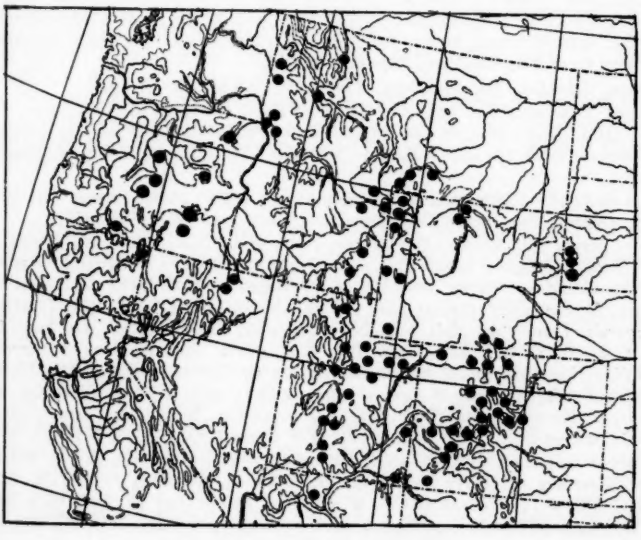

Fig. 14. Distribution of *V. occidentalis.*

mm. wide, sparsely to densely pilosulous or glabrous, tawny, abaxial ribs often rather prominent. *Calyx-limb* 11- to 16-fid.

TYPE LOCALITY: "Near western end of the Craig Mt. Plateau above Lake Waha, Nez Perce County [Idaho], alt. 3500 ft. July 2, 1896".

DISTRIBUTION: Aspen glens and yellow pine woods, wet meadows or grassy places among willows, in rich loam or on open rocky hillsides in the mountains, 4700–11000 ft. alt. Montana to Nevada and Utah; Wyoming and Colorado; also in the Black Hills of South Dakota. Flowering and fruiting May to September.

UNITED STATES:

ARIZONA: Grand Canyon National Park, Neal Springs, north rim, *Collom 1056* (G).

CALIFORNIA: Modoc Co., Willow Creek, *Austin s. n.* (BM, UC, US).

COLORADO: Delta Co., Hotchkiss, *Cowen s. n.* (US); Eagle Co., Pando, *McDonald C289* (US); Garfield Co., Trappers Lake, *Hermann 5451* (MO); Gilpin Co., Tolland, *Palmer 31399* (MO); Grand Co., Tabernash, *Whitehouse 19003* (US); Gunnison Co., Mt. Carbon, *Eggleston 5884* (US); Larimer Co., Rabbit Ears, *Goodding 1560* (D, E, GH, MO, NY, UC, US, WYO); Montezuma Co., West Mancos Cañon, *Baker, Earle, Tracy 129* (BM, D, GH, K, MIN, MO, NY, US, W, WYO); Montrose Co., above Cimarron, *Baker 136* (D, E, GH, K, MO, NY, UC, US, WYO); Summit Co., Breckenridge, *Mackenzie 151* (MO, WYO).

IDAHO: Bannock Co., Pocatello, *Cronquist 2300* (MO); Benewah Co., De Smet Mission, *Leiberg 1010* (ARIZ, GH, K, MO, UC, WYO); Clark Co., Spencer, *Rust 259* (US); Fremont Co., Henry Lake, *Payson & Payson 1997* (GH, MO, NY, UC, WYO); Kootenai Co., Coeur d'Alene, *Rust 259* (US); Lewis Co., Winchester, *Meyer 1448* (MO); Nez Perce Co., Craig Mts., *Henderson 2658* (GH, US); Twin Falls Co., Shoshone Falls, *Garst s. n.* (WTC).

MONTANA: Flathead Co., Columbia Falls, *Williams 195* (MIN, NY, US); Gallatin Co., Bridger Mts., *Jones s. n.* (MO, UC, US, WYO); Fergus Co., Big Snowy Mts., *Hitchcock 16093* (WTC); Madison Co., Taylor Mts., *Hitchcock & Muhlick 15209* (MO); Mineral Co., Savenac Creek, *Moore 308* (GH, MO, US); Park Co., Elton, *Eggleston 7906* (US); Sweet Grass Co., MacLeod, *Pope s. n.* (NY).

NEVADA: Elko Co., Jarbridge Mts., *Train 605* (ARIZ, MO, NY).

OREGON: Deschutes Co., Lapine, *Peck 9606* (GH, MO); Grant Co., Austin, *Henderson 5523* (GH, MO); Harney Co., Myrtle Park, *Peck 21028* (WILLU); Jefferson Co., Camp Sherman, *Peck 19754* (WILLU); Klamath Co., Johnson Prairie, *Applegate 2468* (US).

SOUTH DAKOTA: Lawrence Co., Dumont, *Over 15901* (US); Meade Co., Piedmont, *Pratt s. n.* (MIN); Pennington Co., Oroville, *Rydberg 752* (GH, NY, US).

UTAH: Beaver Co., Beaver, *Palmer 189* (GH, NY); Cache Co., Mt. Naomi Region, *Maguire, Hobson, Maguire 14029* (NY); Carbon Co., 10 mi. e. Sunnyside, *Graham 9604* (GH, MO); Grand Co., La Sal Mts., *Maguire & Maguire 21708* (NY); Iron Co., 10 mi. e. Cedar City, *Graham 8655* (MO); Juab Co., Mt. Nebo, *Harris C2877* (MIN, MO); Piute Co., Marysvale, *Jones 5366* (GG, MO, NY, UC, US); Salt Lake Co., Red Butte Canyon, *Clemens s. n.* (D, E, GH, MO); San Juan Co., Abajo Mts., *Rydberg & Garrett 9724* (NY, WYO); San Pete Co., Ephraim Plateau, *Harris C27707* (MIN, MO); Uintah Co., Little Brush Creek, *Harrison & Larsen 7794* (BRY, MO, WYO); Utah Co., n. Fork Provo Canyon, *Harrison 7244* (BRY, MO); Wasatch Co., Wolf Creek Pass, *Graham 8142* (MO, US); Wayne Co., La Sal Mts., *Rydberg & Garrett 8716* (GH, NY, US, WYO).

WYOMING: Albany Co., Centennial, *Nelson 8716* (D, GH, MO, P, US, WYO); Big Horn Co., *Worthley 15* (US); Carbon Co., T. B. Ranch, *Goodding 71* (D, GG, GH, MO, NY, P, UC, US, WYO); Fremont Co., Wind River, *Nelson 793* (E, GH, MIN, MO, NY, US, WYO); Lincoln Co., Afton, *Payson & Armstrong 3306* (GH, MO, WYO); Sheridan

Co., Big Horn Mts., *Williams & Williams 3204* (D, MO, WYO); Sublette Co., 15 mi. w. Merna, *Payson & Payson 2786* (GH, MO, NY, UC, US, WYO); Teton Co., Hoback Canyon, *Williams & Pierson 656* (GH, MO, NY, S, WYO); Uinta Co., La Barge, *Stevenson 36* (US); Yellowstone National Park, Mammoth Hot Springs, *Burglehaus s. n.* (MIN).

Inasmuch as *Valeriana occidentalis* and the next species, *V. dioica sylvatica*, have been perennially confused in herbaria and in the field, I had hoped for considerable respite in the present treatment. However, even with the large suite of study specimens, it has not been possible to eradicate all the attendant difficulties. The distributions of *V. occidentalis* and *V. d. sylvatica* overlap on their peripheries in western Montana, central Idaho, northern Wyoming and the Black Hills of South Dakota, and it becomes practically impossible to distinguish these taxa in this tension zone. Very frequently the differences are subtle ones and it is difficult to assign names to fit the variants, although these taxa may be easily distinguished outside the area where their distributions overlap.

V. occidentalis	*V. dioica sylvatica*
HABIT: relatively vigorous, to 9 dm. tall, and leafy.	relatively slender, to 4.5 dm. tall, less leafy.
ACHENES: sparsely to densely pilosulous or glabrous, 3–5 mm. long.	glabrous, 2.8–5.2 mm. long.
DISTRIBUTION: Wyoming, Utah, eastern Oregon, northern Nevada, Colorado.	ssoutheast to north-central Canada, western Montana, central Idaho, northern Wyoming.

8. VALERIANA DIOICA L. ssp. **sylvatica**[28] (Sol. ex Richards.) F. G. Mey., stat. nov.

Valeriana sylvatica Sol. ex Richards. in Frankl. 1st Jour. App. 7:730. 1823. T.: *Richardson s. n.!* (BM, CGE, MO photo).
Valeriana dioica var. *sylvatica* (Sol. ex Richards.) Gray, in Proc. Acad. Phila. 63. 1863.
Valeriana wyomingensis E. Nels. in Erythea 7:167. 1899. T.: *A. & E. Nelson 5686!* (BM, D, E, GH, K, MIN, MO, P, UC, US, WYO).
Valeriana septentrionalis Rydb. in Mem. N. Y. Bot. Gard. 1:376. 1900. T.: *Drummond s. n.!* (GH, K, NY).
Valeriana micrantha E. Nels. var. *wyomingensis* (E. Nels.) A. Nels. in Coult. & Nels. Man. Bot. Rocky Mts. 476. 1909.
Valeriana psilodes Gdgr. in Bull. Soc. Bot. Fr. 65:37. 1918. T.: *Rydberg & Bessey 5001!* (D, E, GG, GH, K, NY, WYO).

Perennials 1.5–3.0(–4.5) dm. tall, relatively slender, from slimmish rhizomes about 5 mm. thick. *Stem* sparsely to moderately leafy, 2–4 mm. in diameter, glabrous to glabrescent, more often pilosulous in a line decurrent from the nodes. *Leaves* at the base sometimes forming a loosely tufted rosette with the several adventitious shoots, petiolate, undivided, oblong, ovate-oblong, or spatulate, rarely suborbicular, 3–27 cm. long, entire or essentially so, the blades 1.5–8.0 cm. long, 0.7–2.9 cm. wide, short-acuminate, acute or obtuse; petioles 1–1½(–3) times as long as the blades, spreading-ciliate towards the base; cauline leaves 3–4 pairs, the lowermost short-petiolate, pinnate to pinnatifid, rarely undivided, becoming sessile and much reduced above, oblong, ovate to ovate-oblong, 2.7–11.5 cm. long, gla-

[28] In the Sherardian herbarium at Oxford University a specimen collected by Mr. Tilden, "ex Hudsoniana, 1728" [Hudson's Bay Region] is the oldest collection of *Valeriana* known from North America.

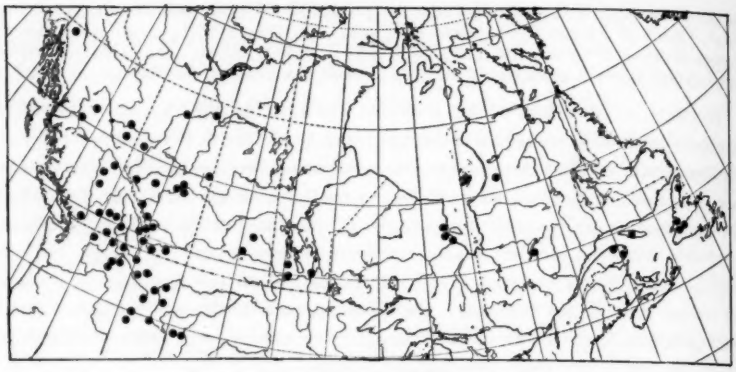

Fig. 15. Distribution of *V. dioica* ssp. *sylvatica*.

brous, the terminal lobe linear- to ovate-oblong, acute or short-acuminate, 1.1–5.1 cm. long, 0.2–2.4 cm. wide, the lateral lobes 1–7 pairs, grading smaller. *Inflorescence* 1.5–3.0 cm. wide in anthesis, later diffuse, 5–18 cm. long, 3.5–10.0 cm. wide, the nodes pilosulous, internodes glabrous or sometimes scattered-pilosulous; bracts 5–6 mm. long, glabrous, flowers gynodioecious. *Corolla* rotate to subrotate, 2–3 mm. long, white, glabrous without, the throat scattered-pilosulous within. *Stamens* and style exserted. *Achenes* ovate to ovate-oblong, 3–5 mm. long, glabrous, tawny to rubiginose, abaxial ribs evident. *Calyx-limb* 9- to 15-fid.

TYPE LOCALITY: "On the Clearwater River". [about 56.5°N., 110°–111° W., Alberta]. July, 1820.

DISTRIBUTION: Meadowlands, moist wooded hillsides in rocky duff-covered clay soil or on talus slopes in broken limestone or granite; Newfoundland northwesterly across Canada to the Rocky Mountains thence southward to Yellowstone National Park and central Idaho; 600–3400 ft. alt. in eastern Canada, and 3300–9500 ft. alt. in the Rocky Mountains. Flowering and fruiting May to August.

CANADA: ALBERTA: Kananaskis River, *Bourgeau s. n.* (GH, P); Waterton Lakes Nat. Park, *Dore & Breitung* (OTB); Atauwan River, *Brinkman 4251* (US); Pipestone Valley, *Brown 426* (GH, MO, US); Cataract Pass, *Brown 1054* (GH, MO, NY); Peace River, *Goode 145* (BM); Edson, *Groh s. n.* (OTB); Beaverlodge, *Jenkins 431* (OTB); Lake Louise, *McCabe 6343* (UC); Dry Fork, *Macleod s. n.* (OBT); Jumping Pound Creek, *Macoun 20688* (NY); McLeod River, 52°80′N., 117°30′W., *Ogilvie s. n.* (E); near Opal, *Raup 3049* (GH); Wood Buffalo Park, *Raup 3050* (GH, NY, UC, US); Edmonton, *Smith 103* (K); Fort Saskatchewan, *Turner s. n.* (OTB); Pigeon Lake, *Turner 5481* (OTB). BRITISH COLUMBIA: Quesnel, *Dawson s. n.* (US); Lake Atlin, *Eastwood s. n.* (GH, US); about 13 mi. s. Savona, 50°32′N., 120°52′W., *Hitchcock & Martin 7418* (GH, NY, UC, WYO); 25 mi. ne. Barkerville, *McCabe 336* (UC); 15 mi. e. 100-Mile House, *McCabe 1070* (UC); Pinantan, *McCabe 2383* (UC); Flathead summit, *McCabe 4985* (UC); Kimberley, *McCabe 6160* (UC); between Burton and Fauquier, *McCabe 6625* (UC); 13 mi. e. Burns Lake, *McCabe 7041* (UC); 30 mi. n. Ft. St. James, *McCabe 7552* (UC); Chilliwack Valley, *Macoun 64901* (NY); Fort St. John, *Moss 8159* (OTB); Hudson Hope, *Raup & Abbe 3675* (MIN, NY, P, S); between Midway and Lake Osoyoos, *Spreadborough 72795* (NY); Relowna, *Warren s. n.* (K); 34 mi. n. Natal, *Weber 2311* (GH,

MO, NY, UC). MANITOBA: Brandon, *Hales s. n.* (OTB); Teulon, *Hunter s. n.* (OTB); Riding Mountain National Park, *Rowe 101* (OTB). NEWFOUNDLAND: Croque, *Banks s. n.* (BM, MO photo); Table Mountain, *Fernald & St. John 10864* (BM, GH, K, NY, P, US, W); Birchy Cove, *Fernald & Wiegand 4064* (GH); Harry's River, *Fernald & Wiegand 4066* (GH); Harrys Brook at Dump Pool, *Kennedy 909* (GH); Port à Port, *Mackenzie & Griscom 10449* (GH); Cape St. George, *Mackenzie & Griscom 11019* (GH). ONTARIO: Attawapiskat, James Bay, *Dutilly & Lepage 15657* (OTB); Fort Albany, *Hutchinson s. n.* (BM, MO photo); Gray Station (mile 229), *Pease 18066* (GH); Eckwan River, James Bay, *Smith 145* (US). QUEBEC: Ungava, 56°N., 75°20′–76°10′W., *Dutilly & Lepage 14303* (OTB); Gaspé County, Grand River, *Fernald s. n.* (GH); Gaspé County, Table-Top Mountain, *Fernald & Collins 249* (GG, GH, K, MIN, NY, US); Lac á Claude, *Louis-Marie et al. 34235* (GH); Riviere Galiote, *Victorin & Germain 25084* (GH); Anticosti, Crique de la Chaloupe, *Victorin & Germain* (GH); Lac Mistassini, *Rousseau & Rouleau 1171* (GH). SASKATCHEWAN: Bjorkdale, *Blaricom s. n.* (OTB); Wallwort, *Breitung 1* (NY); McKague, *Breitung 1018* (MO, OTB, UC); Emma Lake, *Russell s. n.* (OTB).

UNITED STATES:

IDAHO: Custer Co., Bonanza, *Macbride & Payson, 3404* (GH, K, MO, NY, UC, US, WYO); Lemhi Co., Salmon, *Payson & Payson 1798* (GH, MO, NY, UC, WYO).

MONTANA: Beaverhead Co., Pioneer Range, *Hitchcock & Muhlick 12932* (MO); Carbon Co., Red Lodge, *Rose 14* (GH, NY, US); Gallatin Co., Bridger Mts., *Rydberg & Bessey 5001* (D, E, GG, GH, K, NY, WYO); Glacier National Park, *Standley 15009* (US); Granite Co., 15 mi. n. Philipburg, *Hitchcock & Muhlick 9133* (NY); Lewis and Clark Co., Danaher Ranger Station, *Hitchcock 18713* (UC); Madison Co., Madison Range, *Flodman 802* (MIN, MO, NY, US); Meagher Co., Little Belt Mts., *Flodman 801* (NY, US); Missoula Co., Bonner, *Hitchcock & Muhlick 11431* (MO, UC, WYO); Powell Co., Flathead National Forest, *Hitchcock 18636* (UC); Stillwater Co., Beartooth Mts., *Kemp 16* (NY).

WASHINGTON: Okanogan Co., 1 mi. e. Crawfish Lake, *Fiker 2417* (WTC); Pend Oreille Co., 5 mi. n. Ione, *St. John 6358* (MO, WTC).

WYOMING: Big Horn Co., *Worthley 20* (US, WYO); Park Co., Shoshone National Forest, *Williams & Williams 3542* (GH, MO, NY); Sheridan Co., Big Horn Mts., *Tweedy 2059* (NY); Yellowstone National Park, Undine Falls, *Nelson & Nelson 5686* (BM, D, E, GH, K, MIN, MO, P, UC, US, WYO).

Valeriana d. sylvatica throughout its Canadian distribution is practically indistinguishable from *V. dioica* in western Europe. The modern distribution of *V. dioica* is like that of several other plants listed by Hultén as "amphi-atlantic," or species with an eastern American and western European distribution and without an intermediate station in Asia. Among the amphi-atlantic species listed are *Milium effusum*, *Liparis Loeselii* and *Arenaria humifusa*.

The following variation pattern of *V. d. sylvatica* bears mention as follows:

The populations of *V. d. sylvatica* on the edge of the distribution in Montana, Idaho, Wyoming and the Black Hills come into contact with *V. occidentalis*, and in this peripheral zone the collections cannot be reliably determined. The most aberrant populations within this zone manifest the following general characteristics:

Plants more leafy than typical *V. d. sylvatica*, especially at the base. *Leaves* broader, to 2 cm. *Inflorescence* more often paniculate from the start. *Achenes* more often 5 mm. long, lance-linear. Representative specimens: IDAHO: Custer Co., Bonanza, *Macbride & Payson 3404*. MONTANA: Gallatin Co., Bridger Mts., *Rydberg & Bessey 5001*. WYOMING: Yellowstone National Park, Undine Falls, *Nelson & Nelson 5686*.

Series 2. EDULES F. G. Mey., n. ser.

Perennials erect, from stout, conical, multicipital, fleshy to semi-ligneous tap-roots 0.8–3.0 cm. thick; caudex clothed with numerous imbricate, marcescent, brownish to chartaceous leaf bases of previous seasons. *Stem* subscapose, erect, unbranched to the inflorescence, terete or sometimes flattened and alate, glabrous or pubescent. *Leaves* predominantly basal, mostly undivided, rarely pinnate, lingulate-spatulate, the subpetiolar base more or less broadly clasping-patelliform, membranaceous to subcarnose, glabrous or pubescent and usually spreading-ciliate; cauline leaves simulating the basal although reduced. *Inflorescence* an aggregate dichasium; flowers polygamo-dioecious. *Corolla* rotate. *Stamens* and style exserted, anthers distinctly 4-lobed, the thecae sulcate, with the ventral loculae longer than the dorsal. *Achenes* linear- to ovate-oblong or oval, smooth or often transversely rugulose, glabrous or densely pilosulous to subcanescent. *Calyx-limb* 6- to 13-fid. Species, 3.

TYPE SPECIES: *Valeriana edulis* Nutt. ex Torr. & Gray.

DISTRIBUTION: Western and north-central United States and adjoining Canada; Mexico to Costa Rica.

The stout fleshy conical tap-roots and the leaves, which are mostly lingulate-spatulate and undivided, are the most salient characters that mark the species included within series EDULES.

KEY TO THE SPECIES

A. Leaves undivided.
  B. Leaves glabrous, entire. Plants 1.0–2.5 dm. tall. Achenes oblong to oblong-linear, smooth, glabrous. Calyx-limb 6- to 8-fid. Guadalupe Mountains of Texas and New Mexico ..... 9. *V. texana*
  BB. Leaves sparsely puberulent, serrate to serrate-dentate and notched, the sinuses barbellate. Plants 1.0–8.5 dm. tall. Achenes ovate to ovate-oblong, often transversely rugulose, glabrous or densely pilosulous. Calyx-limb 9- to 11-fid. Southern Chiapas to Costa Rica ..... 10. *V. prionophylla*
AA. Leaves divided and undivided, somewhat repand to undulate-lamellate or entire, uniformly spreading-ciliate. Calyx-limb 8- to 13-fid. Western and north-central United States; also in Mexico ..... 11. *V. edulis*

9. VALERIANA TEXANA Steyermark, in Ann. Mo. Bot. Gard. 19:393. 1932. T.: *Moore & Steyermark 3528!* (GH, MIN, MO, NY, UC).

Perennials 1.0–2.5 dm. tall, from stout multicipital caudex and forked conical tap-roots 0.8–2.0 cm. thick, rugose and much contorted in age. *Stem* subscapose, somewhat flattened and narrowly alate, glabrous, the nodes sometimes sparsely pilosulous. *Leaves* predominantly basal, undivided, elliptic- to obovate-spatulate, acute, 5.5–15.0 cm. long, 1.0–2.5 cm. wide, gradually tapering to the subpetiolar base, firmly membranaceous, often with hyaline margins, glabrous; cauline leaves 1–2 pairs, 2–5 cm. long, simulating the basal, becoming bract-like above, sometimes spreading-ciliate on the subpetiolar base. *Inflorescence* 2–6 cm. long in anthesis, later diffuse, 3.5–12.0 cm. long, 2.6–7.0 cm. wide, the internodes glabrous or sometimes scattered-pilosulous; bracts 3–4 mm. long, reduced above, glabrous or pilosulous to spreading-ciliate. *Corolla* rotate, 2.5–3.0 mm. long,

Fig. 16. *Valeriana texana:* Habit, × 1/3; achene; staminate and dissected pistillate flower, × 10.

white, pilosulous towards the base of the tube without, the lobes half as long as to equaling the length of the straight tube, the throat sparsely pilosulous within. *Stamens* and style exserted. *Achenes* oblong to oblong-linear, about 2 mm. long and 1 mm. wide, smooth, brownish, more or less keeled abaxially, glabrous, adaxial ribs evident. *Calyx-limb* 6- to 8-fid.

TYPE LOCALITY: "On boulders in creek, Upper McKittrick Canyon, Guadalupe Mts., Culberson Co., Texas, alt. 2000 m., July 21, 1931".

DISTRIBUTION: On limestone outcrops in the Guadalupe Mountains in western Texas and adjoining New Mexico, 6000–7000 ft. alt. Flowering and fruiting April to July.

UNITED STATES:
NEW MEXICO: Eddy Co., Guadalupe Mts., *Lee s. n.* (US).
TEXAS: Culberson Co., McKittrick Canyon, Guadalupe Mts., *Meyer & Meyer 2177* (MO).

Valeriana texana may be consistently distinguished from *V. edulis*, to which it is most closely related, by the oblong, glabrous and abaxially keeled achenes and the 6- to 8-fid calyx-limb. *Valeriana texana* is endemic to the Guadalupe Mountains of Texas and New Mexico, for which reason it has come to the attention of botanists only recently. The Guadalupe Mountains consist of Permian limestone of the Capitan formation, and this relatively small area is known to support a host of endemic species in other families.

10. VALERIANA PRIONOPHYLLA Standl. in Field Mus. Publ. Bot. 18:1384. 1938. T.: *Stork 3040!* (F).

Valeriana Skutchii Standl. *l. c.* 22:59. 1940. T.: *Skutch 1240!* (F, GH).
Valeriana pumilio Standl. & L. Wms. in Ceiba 1:253. 1951. T.: *Williams 16729!* (MO photo, T).

Perennials 1.0–8.5 dm. tall, from forked conical tap-roots 0.8–2.5 cm. thick, rugose and verrucose in age. *Stem* subscapose, scattered-pilosulous or glabrous, the nodes consistently pilosulous. *Leaves* predominantly basal, imbricate, loosely or often densely tufted, undivided, oblong-linear or oblanceolate- to lingulate-spatulate, subacute to obtuse, 2.5–35 cm. long, 0.6–3.0 cm. wide, gradually tapering to the subpetiolar base, firmly membranaceous, serrate to serrate-dentate and notched, spreading-ciliate, glabrous to uniformly pilosulous, the sinuses densely barbellate; cauline leaves 2–3 pairs, 2–25 cm. long, 0.6–3.0 cm. wide, simulating the basal, mostly sessile, or the petioles short. *Inflorescence* 2–6 cm. wide in anthesis, later diffuse, 15–50 cm. long, 8–12 cm. wide, the nodes tufted-pilosulous, the internodes sometimes scattered-pilosulous; flower-bracts 3–4 mm. long, reduced above, glabrous. *Corolla* rotate, 1.5–3.0 mm. long, white to pink or pale violet, glabrous without, the lobes 1 to 1½ times the length of the indistinctly gibbous or straight tube, the throat glabrous within. *Stamens* and style exserted. *Achenes* ovate to oblong-ovate, 2–3 mm. long, 1.5–2.0 mm. wide, often somewhat keeled abaxially, transversely rugulose or smooth, glabrous to densely pilosulous, sometimes purple-maculate, adaxial ribs evident. *Calyx-limb* 9- to 11-fid.

TYPE LOCALITY: COSTA RICA: "Cerro de la Muerte, 3000 meters, in swampy places beside streams, June 27, 1932".

DISTRIBUTION: Near the summit of the Sierras from southern Chiapas to Costa Rica, 6000–12000 ft. alt., on open limestone slopes, paramos, sphagnum bogs, or in pine woods. Flowering and fruiting intermittently throughout the year.

MEXICO: CHIAPAS: *Ghiesbreght 801* (BM, F, G, K, MO); Mt. Male, near Porvenir, *Matuda 4638* (MAT, MO, NY).

GUATEMALA: CHIMALTENANGO: region of Los Positos, above Las Calderas, *Standley 80143* (F). HUEHUETENANGO: Sierra Cuchumatanes, *Skutch 1240* (GH, F, MO photo); 2½ mi. e. San Mateo Ixtatlan, Sierra de los Cuchumatanes, *Steyermark 49882* (F); Cumbre Papal, between summit and La Libertad, *Steyermark 50952* (F). QUEZALTENANGO: Volcán Santa Mariá, *Skutch 853* (F, GH); Volcán Zunil, *Steyermark 34863* (F, NY). SACATEPEQUEZ: Volcán de Agua, *Standley 65155* (F). SAN MARCOS: between San Sebastian and summit of Volcán Tajumulco, *Steyermark 35551* (F). SOLOLÁ: Volcán

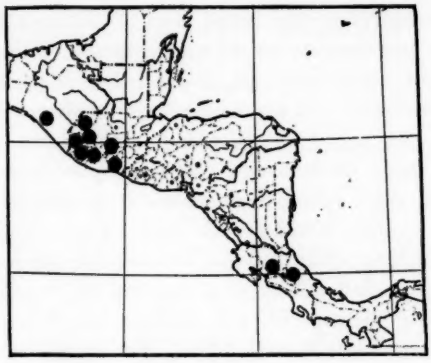

Fig. 17. Distribution of *V. prionophylla.*

Santa Clara, *Steyermark 46936* (F). Without definite locality: Antigua, *Kellerman 4562* (US).

COSTA RICA: CARTAGO: Millsville, *Holm & Iltis 540* (MO); Volcán de Turrialba, *Standley 35260* (US); Irazu, *Stork 2897* (F); Cerro de la Muerte, *Stork 3040* (F), *Williams 16729* (MO photo, T).

Valeriana prionophylla may be distinguished by its undivided linear- to oblanceolate-spatulate leaves, which are serrate to serrate-dentate with the angle at the base of the dentations barbellate. Until recently this species was barely known, although Standley and his colleagues over the past 25–30 years have added greatly to the knowledge about *V. prionophylla.* Variation extremes:

1. Plants robust, up to 10 dm. tall; leaves to 35 cm. long, 1.5–3.0 cm. wide, sharply serrate-dentate, glabrescent. COSTA RICA: CARTAGO: Cerro de la Muerte, *Holm & Iltis 468;* same locality, *Stork 3040* (Type of *V. prionophylla*).

2. Plants slender, 1–5 dm. tall; leaves 2.5–10.0 cm. long, 0.6–1.6 cm. wide, dentate, uniformly puberulent. MEXICO: CHIAPAS: Mt. Male, *Matuda 4638.* GUATEMALA: HUEHUETENANGO: Sierra Cuchumatanes, *Skutch 1240.* COSTA RICA: CARTAGO: Cerro de la Muerte, *Holm & Iltis 466;* same locality, *Williams 16729.* These populations include *V. Skutchii* Standl. and *V. pumilio* Standl. & L. Wms.

11. VALERIANA EDULIS Nutt. ex Torr. & Gray, Fl. N. Am. 2:48. 1841. T.: *Nuttall s. n.!* (BM, MO photo).

Perennials 1–12 dm. tall, robust, from conical, often forked tap-roots 0.8–3.0 cm. thick, becoming semi-ligneous, rugose and verrucose in age; multicipital caudex covered by numerous imbricate, marcescent, brownish to blackish leaf bases of previous seasons. *Stem* subscapose, 2–10 mm. thick, mostly glabrous or occasionally appressed-puberulent, the nodes minutely puberulent. *Leaves* predominantly basal, imbricate, sometimes forming a rather loose rosette, linear or oblong- to obovate-spatulate, undivided or pinnate to pinnatifid, subacute to obtuse, (6–)10–40 cm. long, 0.3–4.2(–6.5) cm. wide, gradually tapering to the subpetiolar base, membranaceous to subcarnose, more or less repand to undulate-lamellate or entire, spreading-ciliate, uniformly pilosulous to appressed white-puberulent or glabrous,

or the veins only puberulent; the lateral lobes of the divided leaves 1–4 pairs, distinct or more or less decurrent on the winged rhachis; cauline leaves 2–6 pairs, pinnate to pinnatifid, rarely undivided, short-petiolate or sessile below, much reduced and bract-like above, 3–22 cm. long, elliptic- to obovate-spatulate. *Inflorescence* 10–45(–75) cm. long, 2–14 cm. wide in anthesis, later diffuse, 14–65 cm. long, 2.5–17.0 cm. wide, the internodes glabrous or pilosulous; flower-bracts 3–4 mm. long, reduced above, glabrous to pilosulous or spreading-ciliate. *Corolla* rotate, that of the pistillate flower minute, about 0.5 mm. long, of the staminate flower 2.5–3.5 mm. long, white, glabrous or pilosulous towards the base of the tube without, the lobes half as long as to equaling the straight tube, the throat scattered-pilosulous or glabrous within. *Stamens* and style exserted. *Achenes* broadly ovate to ovate-oblong or oval, 1.8–4.5 mm. long, 1.5–3.0 mm. wide, glabrous to densely hirtellous or subcanescent, smooth to transversely rugulose, tawny or purple-maculate, margins flat or abaxially involute, abaxial ribs prominent. *Calyx-limb* 8- to 13-fid.

Valeriana edulis is a polytypic assemblage of three geographically disjunct subspecies: *V. e. edulis* in western United States and northern Mexico; *V. e. ciliata* in north-central United States and adjoining Canada; and *V. e. procera* in Mexico.

Torrey & Gray[29] cite the name *Phyllactis obovata* Nutt.[30] [*Valeriana obovata* (Nutt.) Roem. & Schult.] as a possible synonym of *V. edulis* Nutt. ex T. & G. Nuttall's name has never been generally followed, although it has a priority of 23 years. Torrey & Gray[29] remark: *"Phyllactis obovata* is omitted having been described from a plant of the Upper Missouri, not yet in flower, perhaps an undeveloped *V. edulis."* In his description, Nuttall admits the plants were immature with the "flowers collected together in involucrate umbells" and with the leaves "hirsutely-pilose". This description certainly does not apply to *Valeriana edulis*, and I am convinced, not to *Valeriana* at all. I have made an exhaustive search for Nuttall's type of *Phyllactis obovata* but without avail. Furthermore, I have seen no material of *V. edulis* from the plains of north-central South Dakota where Nuttall's specimens allegedly came, *e. g.* "around the Arikaree village", although *V. edulis* occurs as near as the Black Hills. I concur fully with Torrey and Gray's doubts about *Phyllactis obovata*, and it is presently referred to under excluded species (p. 483).

KEY TO THE SUBSPECIES

A. Leaves thinly membranaceous, the cauline more or less regularly pinnate, less often pinnatifid, the lateral lobes narrow, 3–4 distinct pairs, or narrowly decurrent, uniformly spreading-ciliate. Achenes 2.5–4.5 mm. long, glabrous or hirtellous.
  B. Leaves more often glabrous. Wet meadows and on steep mountain slopes; western United States to Chihuahua, Mexico ..... 11a. *V. e. edulis*
  BB. Leaves more often pilosulous. Marly bogs, swamps and marshes; southeastern Canada, north-central United States ..... 11b. *V. e. ciliata*

[29] Fl. N. Am. 2:48. 1841.
[30] Gen. N. Am. Pl. 1:21. 1818.

AA. Leaves firmly membranaceous, the cauline more or less irregularly pinnatifid, less often pinnate, the lateral lobes broad, indistinct, parted nearly to the rhachis above, broadly decurrent on the winged rhachis below, sparsely spreading-ciliate. Achenes 1.8–3.0 mm. long, densely hirtellous to occasionally short-canescent. Durango to the state of Mexico..... 11c. *V. e. procera*

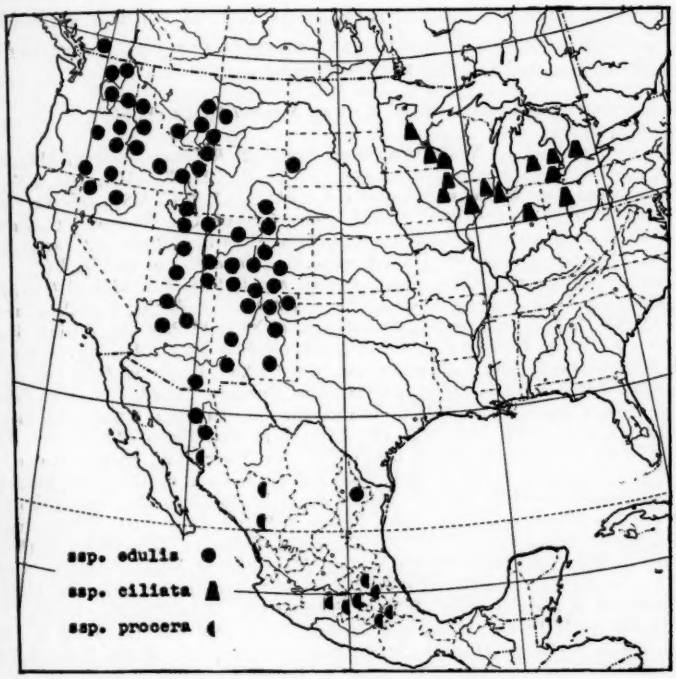

Fig. 18. Distribution of the subspecies of *Valeriana edulis*.

11a. VALERIANA EDULIS Nutt. ex Torrey & Gray ssp. EDULIS.

Patrinia ceratophylla Hook. Fl. Bor. Am. 1:290. 1834. T.: *Douglas s. n.!* (BM, CGE, P).
Valeriana furfurescens A. Nels. in Bull. Torr. Bot. Club 28:232. 1901. T.: *Nelson 7381!* (K, MO, NY, US).
Valeriana trachycarpa Rydb. *ibid.* 31:645. 1904. T.: *Underwood & Selby 352!* (NY).
Valeriana ceratophylla (Hook.) Piper, Contr. U. S. Nat. Herb. 11:532. 1906, *non* HBK.
Valeriana edulis f. *glabra* St. John, Fl. Southeast. Wash. & Adj. Idaho 397. 1937. T.: *Elmer 822!* (D, K, MIN, MO, NY, P, US, WTC).
Valeriana LeSueurii Standl. in Field Mus. Publ. Bot. 22:59. 1940. T.: *LeSueur 1077!* (F).

Perennials 1–12 dm. tall, robust. *Leaves* usually numerous, the lateral lobes of the divided leaves mostly distinct or sometimes narrowly decurrent, terminal lobe 4.5–9.0 cm. long, 0.7–2.0 cm. wide, cauline leaves 2–3 well-developed pairs.

Corolla of the perfect and staminate flower 3.0–3.5 mm. long, of the pistillate minute, 0.5 mm. long, the throat scattered-pilosulous within. *Achenes* 2.5–4.5 mm. long, glabrous to densely hirsutulous. *Calyx-limb* 9- to 13-fid.

TYPE LOCALITY: Walla Walla, Washington.

DISTRIBUTION: In moist pastures, creek bottoms, yellow pine and aspen woods, sagebrush plains, limestone cliffs, and subalpine parks, 5500–11000 ft. alt., southern British Columbia, western United States (except California) to northwestern Mexico. Flowering and fruiting May to September.

CANADA: BRITISH COLUMBIA: w. of Midway, *Macoun 79447* (E, NY).

UNITED STATES:

ARIZONA: Apache Co., White Mountains, *Gould & Robinson 5002* (ARIZ, UC); Cochise Co., Chiricahua Mts., *Blumer 1353* (ARIZ, E, GH, K, MIN, MO, NY, US, WYO); Coconino Co., Williams, *Lemmon s. n.* (BM, D, P, UC, US); Gila Co., Sierra Ancha Mts., *Gould & Hudson 3785* (ARIZ, UC); Graham Co., Pinaleno Mts., *Darrow, Phillips & Pultz 1119* (ARIZ); Grand Canyon National Park, *Collom 1324* (ARIZ, US); Navajo Co., Showlow, *Hough 10* (US); Yavapai Co., *Prescott s. n.* (ARIZ, UC).

COLORADO: Carbon Co., Clear Creek, *Parker, McClintock & Robbins 6366* (ARIZ, WTC); Clear Creek Co., Empire, *Engelmann s. n.* (MO); Costilla Co., Veta Pass, *Ownbey 1384* (MO, NY, WYO); Custer Co., *Cusack s. n.* (OXF); El Paso Co., Petrified Stump, *Letterman s. n.* (MO); Garfield Co., Stuart Creek, *Graham 9715* (MO, US); Gilpin Co., Tolland, *Palmer 31382* (MO); Gunnison Co., Mt. Carbon, *Eggleston 5885* (US); Lake Co., Leadville, *Engelmann s. n.* (MO); La Plata Co., Durango, *Tweedy 520* (US); Larimer Co., Estes Park, *Churchill s. n.* (MO); Montezuma Co., La Plata Mts., *Baker, Earle & Tracy 847* (D, GH, MIN, MO, NY, UC, US); Park Co., Eleven-Mile Canyon, *Killip 36424* (MO, US); Pitkin Co., *Mann s. n.* (MO); Rio Blanco Co., Meeker, *Hanna 1334* (MO); Rocky Mountain National Park, Long's Peak, *Holm s. n.* (MO, S); Routt Co., Rabbit Ears Pass, *Meyer & Meyer 2470* (MO); Saguache Co., Saguache Park, *Rollins 1322* (MO, NY); San Miguel Co., Trout Lake, *Payson & Payson 4130* (GH, WYO); Summit Co., Breckenridge, *Mackenzie 288* (MO); Teller Co., Florissant, *Letterman s. n.* (MO).

IDAHO: Bannock Co., Marsh Valley Station, *Muenscher & Maguire 2442* (GH, MO, UC, WYO); Blaine Co., 10 mi. n. Ketchum, *Cronquist 2534* (MO); Butte Co., 14 mi. n. Leslie, *Hitchcock & Muhlick 8835* (WTC); Fremont Co., Idaho-Wyoming border, *Cronquist 1705* (MO); Idaho Co., White Bird Summit, *Davis 3288* (WTC); Latah Co., Moscow Mts., *Epling & Hauch* [*Houck*] (MO); Nez Perce Co., Lake Waha, *Heller & Heller 3160* (E, MIN, MO, NY, P, UC, US); Teton Co., Driggs, *Cronquist & Davis 2097* (MO); Valley Co., 5 mi. w. McCall, *Hitchcock & Muhlick* (MO); Washington Co., Goose Creek, *Jones s. n.* (PO).

MONTANA: Beaverhead Co., Armstead, *Payson & Payson 1750* (GH, MO, NY, WYO); Cascade Co., 45 mi. s.se. Great Falls, *Daubenmire 48215* (WTC); Fergus Co., Big Snowy Mts., *Hitchcock & Muhlick 12047* (S, UC, WYO); Gallatin Co., Belgrade, *Blankinship s. n.* (MO); Lewis and Clark Co., Helena, *Starz s. n.* (MO); Madison Co., Taylor Mts., *Hitchcock & Muhlick 15211* (MO); Meagher Co., Little Belt Mts., *Hitchcock & Muhlick 12241* (MO, WYO); Park Co., Cooke City, *Hitchcock & Muhlick 13600* (MO, WYO).

NEVADA: Elko Co., Ruby Lake, *Mason 4665* (UC); Humboldt Co., Summit Lake Indian Reservation, *Train 3054* (NY, UC); Washoe Co., 2 mi. w. Vya, *Train 2835* (NY).

NEW MEXICO: Catron Co., 18 mi. e. Mogollon, *Meyer & Meyer 2202* (MO); Colfax Co., Ute Park, *Standley 13625* (US); Grant Co., Hillsboro Peak, *Metcalfe 1194* (BM, D, E, GH, MIN, MO, NY, UC, US); Lincoln Co., White Mts., *Wooton 320* (D, E, GG, GH, MIN, MO, NY, P, UC, US, WYO); Mora Co., Rio de la Casa, *Sturgis s. n.* (GH); Otero Co., Mescalero Indian Reservation, *Wolf 2863* (ARIZ, GH); Rio Arriba Co., Ensenada, *Standley & Bollman 11090* (US); San Miguel Co., Las Vegas, *Studhalter & Cox 4137* (US); Socorro Co., west fork Gila River, *Metcalfe 311* (ARIZ, BM, D, E, GH, K, MIN, MO, NY, P, UC, US); Taos Co., near Taos, *Mathias 570* (MO); Union Co., Sierra Grande, *Standley 6149* (US).

OREGON: Baker Co., Hereford, *Jones 25251* (MO); Crook Co., Ochoco Ranger Station, *Peck 16000* (WILLU); Grant Co., Austin, *Henderson 5525* (GH, MO); Harney Co., Narrows, *Peck 13984* (WILLU); Klamath Co., Klamath Lake, *Peck 15147* (WILLU); Malheur Co., 24 mi. sw. Rome, *Peck 21775* (WILLU); Wallowa Co., Crow Creek, *Sheldon 8511* (MO, NY, US, WYO); Wheeler Co., Ochoco Nat. For., *Weber 2911* (WTC).

SOUTH DAKOTA: Custer Co., Mayo, *Over 1791* (US); Pennington Co., Hill City, *Palmer 37476* (GH, MO, NY).

UTAH: Box Elder Co., Bear River, *Payson & Payson 4965* (GH, MO, US); Cache Co., Logan, *Maguire 21703* (NY); Carbon Co., Willow Springs, *Graham 9541* (MO, US); Daggett Co., Uintah Mts., *Williams 573* (MO, NY, WYO); Duchesne Co., Moon Lake, *Graham 9327* (MO); Grand Co., La Sal Mts., *Payson & Payson 4102* (GH, MO, WYO); Morgan Co., Echo, *Jones s. n.* (GG, MO, UC, US); Salt Lake Co., Salt Lake City, *Clemens s. n.* (D, E, GH, MO); San Juan Co., Abajo Mts., *Maguire & Redd 2136* (GH, MO); San Pete Co., Fairview, *Jones 5552* (GG, MO, NY, P, UC, US, WYO); Sevier Co., 40 mi. ne. Fremont, *Harrison 7359* (MO); Summit Co., Bear River Valley, *Hermann 5857* (GH, MO); Uintah Co., Trout Creek Ranger Station, *Graham 8200* (GH, MO); Utah Co., Provo Cañon, *Palmer 3811a* (GH, MO).

WASHINGTON: Ferry Co., Republic, *Thompson 11691* (GH, MO, NY, US); Grant Co., Grand Coulee, *St. John 7656* (CA, MO); Kittitas Co., Ellensburg, *Whited 60* (US); Lincoln Co., Sprague, *Henderson s. n.* (WTC); Okanagan Co., Wauconda summit, *Fiker 751* (MO, US); Spokane Co., Medical Lake, *Sandberg & Leiberg 53* (GH, NY, US); Stevens Co., Colville, *Sharsmith 4041* (WTC); Whitman Co., Pullman, *Elmer 822* (D, K, MIN, MO, NY, P, US, WTC).

WYOMING: Albany Co., s. Sybille, *Nelson 7381* (K, MO, NY, US); Lincoln Co., near Alpine, *Payson & Armstrong 3450* (GH, MO, WYO); Park Co., Shoshone National Forest, *Williams & Williams 3730* (D, GH, MO, NY, WYO); Sheridan Co., Big Horn Mts., *Tweedy 2061* (NY); Sublette Co., Fremont Lake, *Payson & Payson 2861* (GH, MO, NY, UC, US, WYO); Sweetwater Co., Granger, *Ward s. n.* (US); Teton Co., Two-gwo-tee Pass, *Williams 949* (MO, NY, S, WYO); Yellowstone National Park, Madison River, *Nelson & Nelson 5508* (D, E, GH, MIN, MO, NY, P, US, WYO).

MEXICO: CHIHUAHUA: Memelichi, Río Mayo, *Gentry 2739* (ARIZ, F, GH, GT, K, MO, S, UC); Mesa Correo, *LeSueur 1077* (F); Salto de Babicora, *LeSueur 1418* (ARIZ, F, GH); Sierra Madre, *Nelson 6098* (K, US), *Pringle 1257* (E, F, GG, K, NY, US); Colonia Garcia, *Townsend & Barber 143* (BM, D, E, F, GG, K, MO, MU, NY, US, WYO). NUEVO LEON: Municipio de Galeana, Cerro Potosi, *Schneider 964* (ARIZ, F, G, MO, NY).

Valeriana e. edulis may be distinguished by the more or less regularly divided leaves with the lateral lobes mostly obtuse and distinct to the rhachis, and the achenes 2.5–4.5 mm. long, rugulose or smooth and glabrous to densely hirsutulous.

This subspecies has been described under several binomials, but it seems wholly unnecessary to distinguish more than one taxon under *V. edulis* in western United States. The populations in the northern part of the range, north of Colorado and Utah, are more often glabrous and with broader leaves and generally of more vigorous habit. Nuttall's original collection from the Walla Walla region of southeastern Washington typifies quite adequately *V. e. edulis* from the northern portion of the distribution.

The populations in the southern part of the distribution, particularly in New Mexico, southern Arizona, and northwestern Mexico, grow under conditions of increased aridity, and have narrower and considerably more pubescent leaves. The collections described as *V. trachycarpa* and *V. LeSueurii* typify the populations from the southern part of the distribution.

11b. VALERIANA EDULIS Nutt. ex Torr. & Gray, ssp. **ciliata** (Torr. & Gray) F. G. Mey., stat. nov.

Patrinia longifolia Macnab, in Edinb. N. Phil. Jour. 19:59. 1835. T.: *Macnab s. n.*, *non V. longifolia* HBK.
Valeriana ciliata Torr. & Gray, Fl. N. Am. 2:49. 1841. T.: *Samples 149!* (NY).

Perennials 3–10 dm. tall, relatively slender to robust. *Leaves* few to numerous, the lateral lobes of the divided leaves mostly distinct or sometimes narrowly decurrent, terminal lobe 2.3–6.8 cm. long, 0.7–1.1 cm. wide; cauline leaves 2–3 well-developed pairs. *Corolla* of the perfect and staminate flowers 2.8–3.2 mm. long, of the pistillate about 0.5 mm. long, the throat scattered-pilosulous within. *Achenes* 3–4 mm. long, glabrous. *Calyx-limb* 9- to 13-fid.

TYPE LOCALITY: Urbana, Ohio.

DISTRIBUTION: In low peaty hummocks, marly bogs, prairies and tamarack swamps or wooded hillsides. Minnesota to Illinois, Michigan to Ohio. Flowering and fruiting May to October.

CANADA: ONTARIO: London, *Saunders s. n.* (OTB); Goderich, *Victorin, Germain & Dominique 45980* (GH, OTB).

UNITED STATES:

ILLINOIS: Cook Co., Chicago, *Babcock s. n.* (FI, MO, P, US); Henry Co., Geneseo, *Dobbs 20* (GH); Kane Co., Aurora, collector unknown, (GH); Lake Co., Sand Barren Beach, *Gates 1666.3* (GH); McHenry Co., Fox River Grove, *Benke 6473* (GH); Stephenson Co., Freeport, *Johnson s. n.* (MIN, US).

INDIANA: Cass Co., Hoovers, *Friesner 20607* (GH, MO, S).

IOWA: Clayton Co., Edgewood, *Shimek s. n.* (MIN); Black Hawk Co., low prairie, *Burk 274* (MO); Fayette Co., *Fink s. n.* (GH, MIN, US); Floyd Co., Nora Springs, *Shimek s. n.* (MIN); Winneshiek Co., Decorah Twp., Sec. 26, *Tolstead s. n.* (UC).

MICHIGAN: Kalamazoo Co., Pawpaw Lake, *Haines 447* (GH); Oakland Co., Rochester, *Chandler s. n.* (MSC, US); Washtenaw Co., Ann Arbor, *Almendinger s. n.* (MU).

MINNESOTA: Dakota Co., Nicols, *Moore, Butters & Jenkins 15116* (MIN); Fillmore Co., Etna, *Moore & Phinney 12485* (MIN); Goodhue Co., Cannon Falls, *Sandberg 345* (US); Hennepin Co., Fort Snelling, *Mearns 426* (US); Houston Co., Spring Grove, *Rosendahl 275* (GH, MIN); Mower Co., Austin, *Moore & Phinney 12457* (MIN); Todd Co., Round Prairie Landing, *Parry s. n.* (MO); Waseca Co., Wilton, *Sheldon 638* (MIN); Winona Co., Winona, *Holzinger s. n.* (MIN, US).

OHIO: Champaign Co., cedar swamp, *Bartley & Pontius 812* (NY, US); Franklin Co., Columbus, *Sullivant s. n.* (G, GH, MO, OXF).

WISCONSIN: Columbia Co., 5 mi. e. Portage, *Wadmond s. n.* (MIN); Dane Co., Madison, *Hermann 8958* (NY); Grant Co., Lancaster, *Pringle s. n.* (GH); Iowa Co., Barnweld, *Fassett 8120* (MIN); La Crosse Co., La Crosse, collector unknown (MO); Racine Co., Racine, *Davis s. n.* (MO); Walworth Co., Bloomfield, *Wadmond 4226* (MIN).

Valeriana edulis is essentially a western American species, the modern distribution of which may have developed its pattern in close association with the effects of Pleistocene glaciation. At the present time, however, the western and eastern populations are completely out of contact, so that interbreeding between these taxa is quite impossible. Purely on a morphological basis, the populations in the West and those in the East are barely distinguishable, but I am convinced of the intrinsic value of the ecologic factors as a basis for distinguishing these taxa. *Valeriana e. ciliata* is essentially a plant of bogs and swamps throughout the distribution where it occurs wholly within glaciated areas, except in the driftless area in Wisconsin.

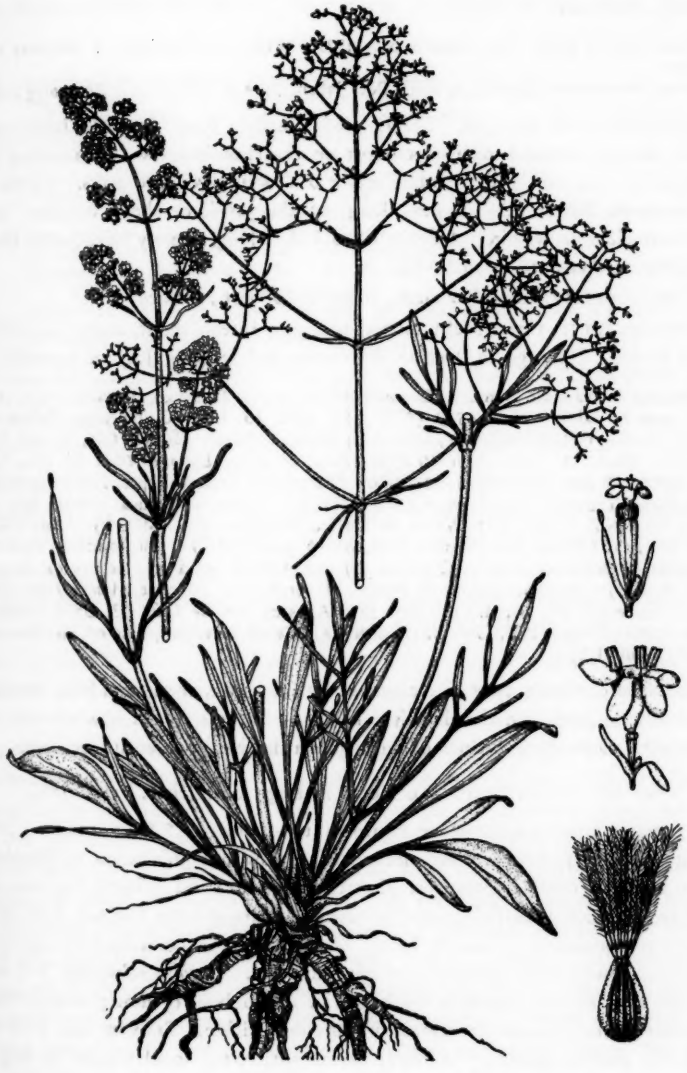

Fig. 19. *Valeriana edulis* ssp. *ciliata:* Habit, × ⅓; pistillate and staminate flower, × 7; achene (abaxial side), × 4.

11c. VALERIANA EDULIS Nutt. ex Torr. & Gray ssp. **procera** (HBK.) F. G. Mey., stat. nov.

Valeriana procera HBK. Nov. Gen. et Sp. 3:329. 1819. T.: *Humboldt & Bonpland s. n.!* (P).
Valeriana knautioides Graebn. in Engl. Bot. Jahrb. 26:427. 1899. T.: *Ehrenberg 172.*

Perennials 3–10 dm. tall. *Leaves* predominantly basal, few, the lateral lobes mostly distinct above, broadly decurrent on the rhachis below, the terminal lobe (1.2–)1.4(–5.0) cm. wide; cauline leaves 3–6 well developed pairs. *Corolla* of the staminate flower 2.5–3.0 mm. long, of the pistillate about 0.5 mm. long, the throat glabrous within. *Achenes* 1.8–3.0 mm. long, densely hirtellous to short-canescent. *Calyx-limb* 8- to 12-fid.

TYPE LOCALITY: near Pázcuaro, at 6000–7000 ft., Mexico.

DISTRIBUTION: Open rocky slopes, oak-pine forest, moist sandy soil, 8000–10400 ft. alt. Durango to Puebla. Flowering and fruiting July to September.

MEXICO: DURANGO: 5 mi. n. Coyotes, 45 mi. w. C. Durango, *Maysilles 7146* (MO, MU); near El Salto, *Nelson 4539* (NY, US), *4581* (S, US); C. Durango, *Palmer 609* (BM, E, F, GG, GH, K, MO, NY, UC, US); Otinapa, *Palmer 380* (F, GH, K, MO, NY, UC, US). HIDALGO: Regla, *Galeotti 2550* (BR); El Chico, *Lyonnet 1042* (F, US); Tula, *Rose, Painter & Rose 8331* (US). MEXICO: Comunidad Temascaltepec, *Hinton 505* (K); Meson Veijo, Temascaltepec, *Hinton 1319* (GH, K); Valley of Toluca, *Pringle 4206* (D, F, GH, MO, NY, S, UC, US); Vallée de Mexico, *Schaffner 193* (MO, P); Llano Grande above Rio Frio 54 km. from Mexico City, *Sharp 4468* (MO). MICHOACÁN: Pázcuaro, *Humboldt & Bonpland s. n.* (MO photo, P). MORELOS: road to Cuernavaca, *Kenoyer A416* (F, MO). PUEBLA: vicinity of Puebla, Mayorazgo sur l'Atoyac, *Arsène 1044* (US); entre les haciendas Sta. Barbara et Cristo sur l'Alseseca, *Arsène 1363* (P, US); Esperanza, *Purpus 2741* (F, MO, NY, UC, US). SONORA: Cerro Saguarivo, east of San Bernardo, *Pennell 19592* (US).

Valeriana e. procera may be recognized by the leaves, the lateral lobes of which are broadly decurrent on the rhachis. This is in contrast to *V. e. edulis* with the lateral lobes more often distinct or when pinnatifid not apparently decurrent.

Series III. CERATOPHYLLAE Höck, in Engl. Bot. Jahrb. 3:52. 1882.

Perennials from napiform or fusiform tap-roots, to 5.5 cm. thick. *Stem* subscapose to leafy, branched or unbranched, glabrous or puberulent to pilosulous. *Leaves* basal or cauline, petiolate, pinnate to bipinnatifid, elliptic- to obovate-spatulate, glabrous or hirtellous on the veins, the lateral lobes distinct, 2–10 pairs, laciniate or sometimes palmately lobed. *Inflorescence* a compound or aggregate dichasium; flowers hermaphroditic or gynodioecious. *Corolla* subrotate, 3–4 mm. long, the lobes usually equalling the length of the gibbous or nearly straight tube, the throat short-sericeous or scattered-pilosulous within. *Stamens* and style exserted, the anthers distinctly 2-lobed, thecae entire, the loculae equal in length. *Achenes* elliptic to ovate-oblong, 2.0–6.5 mm. long, abaxial ribs becoming carinate or at least relatively prominent. *Calyx-limb* 9- to 20-fid. Species, 3.

TYPE SPECIES: *Valeriana ceratophylla* HBK.

DISTRIBUTION: Mexico.

The napiform roots, the laciniate leaves, the corolla with sericeous throat, and the achenes usually with carinate ribs combine to distinguish this series.

KEY TO THE SPECIES

A. Lateral leaf segments trigonal in outline, 2–9 cm. long, 0.2–5.0 cm. wide, most frequently long-laciniate, associated on the rhachis with 1–3 ligular appendages. East-central to south-central Mexico..... 12. *V. laciniosa*

AA. Lateral leaf segments without ligular appendages.

B. Stem simple. Leaf segments palmately 3- to 7-lobed or cleft, 3.0–4.5 cm. long, 2.5–5.5 cm. wide, obtuse, spreading-ciliate, the veins often hirtellous, mostly below. Achenes glabrous. Calyx-limb 14- to 20-fid. Northeast to south-central Mexico..... 13. *V. albo-nervata*

BB. Stem branched. Leaf segments short-laciniate, 0.8–2.0 cm. long, 0.1–0.5 cm. wide, acute, glabrous. Achenes densely hirtellous to short-sericeous. Calyx-limb 11- to 13-fid. South-central Mexico.... 14. *V. ceratophylla*

12. VALERIANA LACINIOSA Mart. & Gal. in Bull. Acad. Brux. 11[1]:121. 1844. T.: *Galeotti 2548!* (BR, K, MO photo, P).

Valeriana calcicola Greenm. in Proc. Am. Acad. 41:252. 1905. T.: *Pringle 9622!* (GH).
Valeriana macropoda Greenm. *l. c.* 1905. T.: *Pringle 8998!* (BM, E, F, FI, GG, GH, MIN, MO, NY, P, S, UC, US).
Valeriana Nelsonii Greenm. *l. c.* 253. 1905. T.: *Nelson 4574!* (GH, US).

Perennials 1.5–8.5 dm. tall, slender, sometimes divaricate at the base, from napiform to somewhat fusiform tap-roots, 1–4 cm. thick, rugose to somewhat verrucose; caudex covered with a succession of marcescent, brownish, chartaceous leaf bases. *Stem* subscapose, unbranched to the inflorescence, 1–5 mm. in diameter, glabrous or scattered-pilosulous, the nodes consistently pilosulous. *Leaves* predominantly basal, imbricate, forming a loosely tufted rosette, petiolate, pinnate-bipinnatifid, elliptic- to oblanceolate-spatulate, 9–40 cm. long, 3–8 cm. wide, glabrous or hirtellous, especially below; lateral lobes approximately 6–10 distinct pairs, irregularly disposed, relatively long-laciniate, 1- to 8-cleft, or dilated and somewhat trigonal towards the tip, acute or apiculate, the divisions ascending or divaricate, frequently recurved, 2.2–9.0 cm. long, 0.2–5.0 cm. wide, usually associated at the rhachis with 1–3 ligular appendages, rudimentary or equalling the lateral segments, also similarly cleft, or absent, the terminal lobe simulating the lateral lobes, 1.1–10.0 cm. long, 0.1–0.3 cm. wide; petioles grading to the rhachis, sparsely hirtellous to papillate or glabrescent, spreading-ciliate towards the subpetiolar base; cauline leaves 1–2 pairs, simulating the basal, or bract-like. *Inflorescence* an aggregate dichasium, 1.5–36.0 cm. long in anthesis, later diffuse, 2–27 cm. long, 2–14 cm. wide, the nodes often tufted-pilosulous, internodes glabrous, or pilosulous; bracts 2.0–3.5 mm. long, reduced above, glabrous, somewhat erose; flowers hermaphroditic or gynodioecious. *Corolla* subrotate, that of the perfect flowers 3–4 mm. long, of the pistillate 1.0–1.1 mm. long, white to pink, glabrous without, the lobes nearly as long as the gibbous tube, the throat densely white-sericeous or scattered-pilosulous within. *Stamens* and style exserted. *Achenes* ovate to ovate-oblong, 4.0–6.5 mm. long, 2.5–3.5 mm. wide, glabrous or uniformly

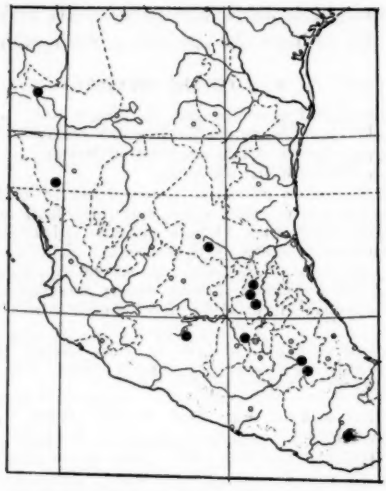

Fig. 20. Distribution of *V. laciniosa*.

pilosulous sometimes only on the adaxial side, abaxial ribs more or less carinate. *Calyx-limb* 9- to 20-fid.

TYPE LOCALITY: Santa-Maria, près de Morelia de Michoacán, 6500–7000 pieds, Mexico.

DISTRIBUTION: Fields, limestone hills in cut-over oak woods on mountain sides among rocks, 4500–6000 ft. alt. Durango and Hidalgo to Puebla. Flowering and fruiting June to August.

MEXICO: DURANGO: without locality, *Garcia 317* (US); El Oro to Guanacevi, *Nelson 4744* (GH, US); El Salto, *Nelson 4574* (GH, US). HIDALGO: mountain side among rocks, *Chase 7346* (F); Ixmiquilpan, *Purpus s. n.* (UC); Dist. Jacala, between Jacala and Zimapan, *Moore & Wood 3923* (BH); Dist. Atotonilco el Grande, Cerro Colorado, *Moore & Wood 4176* (MO); Dist. Zimapan, *Moore & Wood 4274* (BH). MEXICO: Lecheria Station, *Pringle 8998* (BM, E, F, FI, GG, GH, MIN, MO, NY, P, S, UC, US). MICHOACÁN: Morelia, La Huerta, *Arsène s. n.* (D, F); Morelia, *Galeotti 2548* (BR, K, P). OAXACA: Mitla, *Andrieux 326* (D, K, P). PUEBLA: Tehuacan, *Pringle 9622* (GH); Esperanza, *Purpus s. n.* (UC). SAN LUIS POTOSI: without definite locality, *Virler 1813* (P).

Valeriana laciniosa is clearly related to *V. ceratophylla*, but *V. laciniosa* may be readily distinguished by its subscapose, unbranched stem and relatively long-laciniate leaves which are subtended by ligular appendages.

With a paucity of study material, leaf variation in *V. laciniosa* was difficult to interpret, and the collection of *Andrieux 326* from Oaxaca exhibits much broader to more or less trigonal and apiculate leaves. This suggests the polymorphic tendencies of *V. laciniosa*, and with more copious material it is likely that subspecific taxa under this species would become evident.

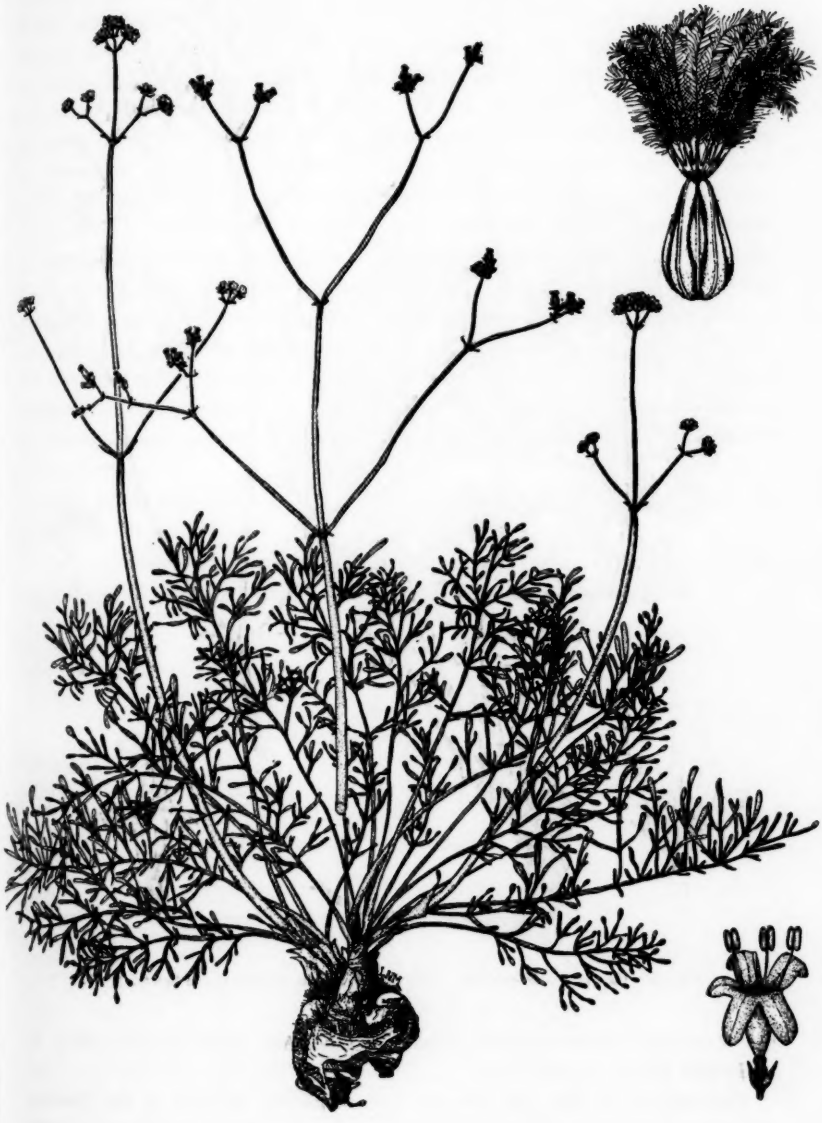

Fig. 21. *Valeriana laciniosa:* Habit, × 2/5; achene and flower, × 7.

Fig. 22. *Valeriana albo-nervata:* Habit, × ⅓; dissected and entire flower, × 10.

13. VALERIANA ALBO-NERVATA Robins. in Proc. Am. Acad. 27:170. 1893. T.: *Pringle 3612!* (F, GH, US).

Perennials 6–11 dm. tall, slender, from napiform to more or less fusiform, often forked tap-roots 2.0–5.5 cm. thick, transversely rugose to verrucose; caudex 2–6 cm. long, clothed with few marcescent, chartaceous leaf bases. *Stem* subscapose, 3–6 cm. in diameter, uniformly pilosulous or puberulent mostly on the

upper portion, or glabrescent, the nodes consistently puberulent. *Leaves* predominantly basal, rather closely imbricate and often loosely tufted, petiolate, pinnately divided, elliptic- to oblanceolate-spatulate, 12–40 cm. long, 4.5–13.0 cm. wide, spreading-ciliate, the veins hirtellous, sometimes glabrous above, the lateral lobes 5–8 pairs, distinct, irregularly disposed, 3.0–4.5 cm. long, 2.5–5.5 cm. wide, palmately 3- to 7-lobed or cleft, obtuse and often again short-cleft; petioles grading to the rhachis, sparsely to densely hirtellous, spreading-ciliate towards the base; cauline leaves 1–2 pairs, simulating the basal, 2.5–23.0 cm. long, the uppermost much reduced. *Inflorescence* an aggregate or sometimes a compound dichasium, the terminal dichotomies 3.0–3.5 cm. wide in anthesis, later diffuse, 7–30 cm. long, 3.5–21.0 cm. wide, the nodes often tufted-pilosulous, internodes glabrous or pilosulous; bracts 2–4 mm. long, reduced above, glabrous, papillate-ciliate; flowers hermaphroditic. *Corolla* subrotate, 3.0–3.5 mm. long, white, glabrous without, the lobes half as long as to equalling the gibbous tube, the throat densely white-sericeous within. *Stamens* and style exserted. *Achenes* ovate to ovate-oblong, 3.5–6.0 mm. long, 2–3 mm. wide, glabrous, abaxial ribs subcarinate. *Calyx-limb* 14- to 20-fid.

Type Locality: Hillsides, San José Pass, San Luis Potosi, Mexico. July 12, 1890.

Distribution: On open oak-studded limestone slopes, 2300–6000 ft. alt. Sierra Madre Oriental of Mexico. Flowering and fruiting March to July.

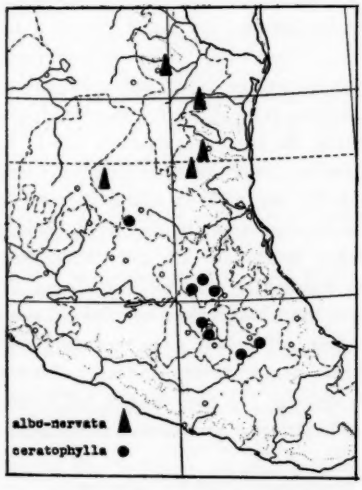

Fig. 23. Distribution of *V. albo-nervata* and *V. ceratophylla*.

Mexico: nuevo leon: Dist. Aramberri, Dulces Nombres, *Meyer & Rogers* (K, MO); Monterrey, *Orcutt 571* (US). san luis potosi: San José Pass, *Pringle 3612* (F, GH, US). tamaulipas: Jaumave Rd. 13 mi. sw. C. Victoria, *McVaugh 9855* (MO); Jaumave, *Runyon 36* (US); Huisachal, *Stanford, Lauber & Taylor 2095* (US); Miquihuana, *Stanford, Lauber & Taylor 2437* (US); between Marcella and Hermosa, *Stanford, Lauber & Taylor 2437a* (US).

Valeriana albo-nervata is one of the most distinctive of Mexican Valerianas. It may be easily recognized by the leaves, the lateral lobes of which are palmately 3- to 7-lobed or cleft, and with the veins white-hirtellous. Until recently this species remained very imperfectly known, although I found it abundant over a rather wide area in the Sierras of Tamaulipas and Nuevo Leon.

14. Valeriana ceratophylla HBK. Nov. Gen. et Sp. 3:333. 1819. T.: *Humboldt & Bonpland s. n.!* (MO photo, P), *non V. ceratophylla* (Hook.) Piper (*Patrinia ceratophylla* Hook.).

Valeriana Napus Lindl. in Bot. Reg. Misc. 76. 1840. T.: *Hartweg s. n.* (CGE, K).
Valeriana ramosissima Mart. & Gal. in Bull. Acad. Brux. 11^1:122. 1844. T.: *Galeotti 2552!* (BR, MO photo, P).

Perennials 1.7–5.7 dm. tall, slender, from napiform to somewhat fusiform, often forked tap-roots 1.5–3.0 cm. thick, transversely rugose to verrucose; caudex 2–4 cm. long, covered with a succession of imbricate, marcescent, brownish, chartaceous leaf bases and dried broken stems from previous seasons. *Stem* branched, 1–3 mm. in diameter, glabrous, the nodes minutely papillate to pilosulous. *Leaves* predominantly basal, rather closely imbricate, often loosely tufted with the several basal shoots, petiolate, bipinnate-pinnatifid, elliptic- to oblanceolate-spatulate, 8–30 cm. long, 1.0–3.8 cm. wide, glabrous, the lateral lobes 5–8 distinct pairs, irregularly disposed, 0.8–2.0 cm. long, 0.1–0.5 cm. wide, rather abruptly dilated towards the tip, short laciniate, 1- to 3-lobed or cleft, and again short-cleft, mucronate, the terminal lobe similar; petioles grading to the rhachis, sparsely hirtellous; cauline leaves 1–3 pairs, simulating the basal but smaller, 5.0–11.2 cm. long, the uppermost much reduced. *Inflorescence* an aggregate or compound dichasium, the terminal dichotomies 1.4–2.8 cm. wide in anthesis, later slightly diffuse, 1.0–3.5 cm. long, 1.4–3.5 cm. wide, the internodes densely puberulent in a shallow groove decurrent from the nodes; bracts 2.0–2.5 mm. long, somewhat erose, reduced above, spreading-ciliate, frequently scattered-hirtellous; flowers hermaphroditic. *Corolla* subrotate, 3.5–4.0 mm. long, white to pinkish, sparsely to rather densely pilosulous without, the lobes half as long as to exceeding the length of the gibbous or straight tube, the throat densely white-sericeous. *Stamens* and style exserted. *Achenes* elliptic to ovate-oblong, 2–5 mm. long, 1.5–2.0 mm. wide, densely hirtellous to short-sericeous, abaxial ribs prominent, subcarinate. *Calyx-limb* 11- to 13-fid.

Type Locality: Chapoltepec, 7000 ft., Mexico.

Distribution: Dry rocky hills, 8000–8500 ft. alt. Sierra Madre Oriental, San Luis Potosi and Hidalgo to Puebla. Flowering June to September.

MEXICO: HIDALGO: Cerro Ventosa, between Pachuca and Real del Monte, *Galeotti 2552* (BR, MO photo, P); Metepec Station, *Pringle 13020* (ARIZ, F, GH, K, US); Ixmiquilpan, *Purpus s. n.* (US); Pachuca, *Purpus 401* (UC, US). MEXICO: forets a la desierta Nieja, *Bourgeau s. n.* (P); Chapoltepec, *Humboldt & Bonpland s.n.* (MO photo, P). MICHOACÁN: Morelia, Loma, *Arsène s. n.* (E). PUEBLA: San Luis Tultitlanapa, *Purpus 3338* (F, G, MO, NY, UC, US); between Tepeaca and Santa Rosa, *Rose & Hough 4736* (US). SAN LUIS POTOSI: without definite locality, *Virler 1809* (P).

Valeriana ceratophylla may be readily distinguished by its profusely branched stems, narrow unsubtended laciniate leaf lobes, and hirtellous flowers, fruits, and bracts.

Series IV. CLEMATITES F. G. Mey., n. ser.

Perennials or annuals, voluble or erect, from subnapiform to fusiform tap-roots. *Stem* leafy, branched or unbranched, terete or sometimes quadrangular, glabrous or pubescent. *Leaves* cauline or basal, petiolate, undivided or 3-parted, elliptic, ovate or suborbicular, cordate to reniform or palmately lobed, irregularly dentate to repand or entire, sparsely to densely spreading-hirtellous or pubescence restricted to the veins. *Inflorescence* an aggregate or compound dichasium; flowers hermaphroditic or gynodioecious. *Corolla* infundibuliform, the tube gibbous, the throat scattered to densely pilosulous within. *Stamens* and style exserted; anthers 2-lobed, the thecae entire, the loculae equal in length. *Achenes* linear- to ovate-oblong, usually somewhat falcate to more or less ampulliform, 2–4 mm. long, 0.9–1.5 mm. wide, glabrous or sometimes pilosulous on the adaxial side. *Calyx-limb* 11- to 14-fid. Species, 5.

TYPE SPECIES: *Valeriana clematitis* HBK.

DISTRIBUTION: Mexico, except *V. urticaefolia* which occurs throughout Central America and at least to Peru in the Andes.

The undivided leaves and the more or less arcuate and linear- to ovate-oblong achenes are the predominant characters that mark the species of this series.

KEY TO THE SPECIES

A. Plants voluble or clambering, rarely erect. Leaves 2–3 times as long as wide, ovate to elliptic or suborbicular, acuminate to subcaudate, entire or slightly dentate, the petioles mostly shorter than the blades. Northeastern Mexico to Central America; also in Colombia..... 15. *V. clematitis*

AA. Plants erect. Leaves about as long as wide, acute to obtuse, serrate to irregularly repand-dentate or palmately lobed, or essentially entire.

B. Leaves ovate to suborbicular, undivided. Annuals, slender and mostly unbranched at the base.

C. Leaves mostly suborbicular and cordate, petioles usually longer than the blades. Stem manifesting pubescence in a line on the upper portion, diminishing below. Achenes ampulliform, the abaxial veins more or less submedian. Corolla campanulate-infundibuliform. Central Mexico..... 16. *V. Selerorum*

CC. Leaves mostly ovate and truncate at the base, petioles usually shorter than the blades. Stem uniformly pubescent or glabrous. Achenes fabriliform (bellows-shaped), the abaxial veins more or less peripheral. Corolla infundibuliform to subsalverform. Mexico to Panama..... 17. *V. urticaefolia*

BB. Leaves reniform-cordate to palmately-lobed, undivided or with 1 pair of lateral lobes. Perennials from a thickened branched caudex.
D. Plants 6.8–13.0 dm. tall, robust. Leaves reniform-cordate, 5–15 cm. wide, irregularly and often deeply dentate to repand-dentate. Chiapas and Guatemala..... 18. *V. cucurbitifolia*
DD. Plants 1.5–2.7 dm. tall, slender. Leaves palmately 5- to 7-lobed, more or less hastate to cordate..... 19. *V. palmatiloba*

15. VALERIANA CLEMATITIS HBK. Nov. Gen. et Sp. 3:327. 1819. T.: *Humboldt & Bonpland* (P).

Valeriana laurifolia HBK. *l. c.* 328. 1819. T.: *Humboldt & Bonpland!* (MO photo, P).
Valeriana subincisa Benth. Pl. Hartw. 39. 1839. T.: *Hartweg 303!* (CGE, D, K, NY).
Valeriana Pavonii Poepp. & Endl. Nov. Gen. et Sp. 3:16, *t. 215*. 1845. T.: *Poeppig s. n.!* (MO, W).
Valeriana hispida Turcz. in Bull. Soc. Nat. Mosc. 25²:172. 1852. T.: *Jameson 794!* (BM, CGE, D, FI, K, MO).
Valeriana Pavonii Poepp. & Endl. var. *yungasensis* Briq. in Ann. Conserv. & Jard. Bot. Genève 17:337. 1913. T.: *Bang 298!* (D, MO).
Valeriana Ghiesbrechtii Briq. *l. c.* 17:345. 1914. T.: *Ghiesbreght s. n.!* (D, K, MO, P).
Valeriana laxissima Standl. & L. Wms. in Ceiba 1:252. 1951. T.: *Williams & Allen 16524!* (T).

Perennials voluble to clambering or erect, 3.5–12.0 dm. tall, from a short rhizome. *Stem* leafy, often profusely branched, rarely unbranched, terete or sometimes quadrangular, becoming suberous or subligneous in age, 2–6 mm. thick, scattered-hirtellous, the nodes more densely so, the young lateral branches hoary-puberulent, soon glabrate. *Leaves* cauline, petiolate, undivided, elliptic to ovate or suborbicular, usually somewhat truncate at the base, acute to acuminate or subcaudate, 4–12 cm. long, entire or slightly dentate, sparsely to densely pilosulous or subcanescent, especially below, the blades abruptly expanding, 3.0–10.5 cm. long, 1.4–4.8 cm. wide; petioles rarely equaling the blades, 1.0–5.6 cm. long, sparsely to densely pilosulous or subcanescent. *Inflorescence* an aggregate or compound dichasium, terminal branches 2.6–20.0 cm. long, 4.5–16.0 cm. wide in anthesis, later diffuse, 8.5–53.0 cm. long, 7.5–30 cm. wide, nodes and internodes glabrous or spreading-pilosulous; bracts 1.5–4.0 mm. long, reduced above, glabrous or hirtellous; flowers gynodioecious. *Corolla* infundibuliform, that of the perfect flower 2.0–5.5 mm. long, of the pistillate 0.9–3.0 mm. long, white to pale lavender, glabrous or hirtellous towards the base of the tube without, the lobes half as long as the gibbous tube, the throat sparsely pilosulous within. *Stamens* and style exserted. *Achenes* linear-oblong, somewhat falcate, 2.0–3.5 mm. long, 0.9–1.2 mm. wide, glabrous, smooth, tawny to rubiginose or purpurascent, abaxial ribs evident. *Calyx-limb* 10- to 12-fid.

TYPE LOCALITY: COLOMBIA: paramo de Saraguru.

DISTRIBUTION: Thickets, damp moist woods in rocky soil, often in cloud-shrouded mountain summits, 3600–13000 ft. alt. Northeastern Mexico to Guatemala; also in Colombia. Flowering and fruiting throughout the year.

MEXICO: CHIAPAS: Volcán Tacana, *Matuda 2892* (F, K, MAT, MO, MU, NY). FEDERAL DISTRICT: desierto de Los Leones, *Balls 4059* (BM); Eslava, *Pringle 8901* (F, GH, MO, MU, NY, S, US); Valle de Mexico, *Schaffner s. n.* (MO, P). HIDALGO: Banco, *Hartweg 303* (CGE, D, K, NY); Encarnacion, *Kenoyer s. n.* (MO); Dist. Zimapan,

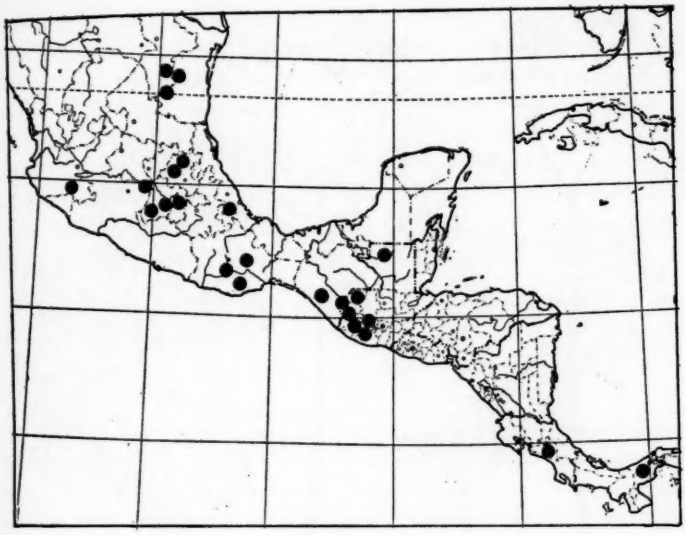

Fig. 24. Distribution of *V. clematitis.*

Barranca de las Verduras, *Moore & Wood 4498* (MO). JALISCO: nw. slopes Nevado de Colima, *McVaugh 10063* (MO); Volcano of Colima, *Pringle 4390* (BM, E, F, GG, GH, K, MIN, MO, NY, P, S, UC, US, WYO). MEXICO: *ca.* Tolucam, *Andrieux 323* (D, P); Popocateptl, *Balls 4217* (BM); foret de la Desierta Nieja, *Bourgeau 1064* (D, GH, P, S, US); Dist. Temascaltepec, Meson Viejo, *Hinton 2732* (D, GH, MO, NY); Dist. Temascaltepec, Cumbre-Cruz, *Hinton 8981* (GH); Cañada de San Rafael, *Lyonnet & Elcoro 1927* (US); Mt. Ajusco, between Mexico City and Cuernavaca, *Mexia s. n.* (UC); Ixtaccihuatl, *Purpus 1782* (F, G, MO, NY, UC, US). MICHOACÁN: Morelia, Cerro Azul, *Arsène s. n.* (D); n. nw. C. Hidalgo, *ca.* 19°48′N., 100°40′W., *McVaugh 9953* (MO). OAXACA: Zempoaltepetl, top of mountain, *Camp 2623* (NY); Zempoaltepec, *Liebmann 10825* (US); se. Miahuatlan, *Nelson 2533* (US); Alvarez, *Palmer 581* (F, GH, MO, NY, US). TAMAULIPAS: 7 km. sw. Miquihuana, *Stanford, Retherford, Northcraft 702* (GH, MO, NY, UC); Pena Nevada, *Stanford, Lauber, Taylor 2548* (US). VERA CRUZ: Orizaba, *Liebmann 10820, 10821, 10822* (US); Maltrata, *Matuda 1349* (MAT, MO, MU); Yavezia, *Galeotti 2683* (US, W).

GUATEMALA: CHIMALTENANGO: Santa Elena, *Skutch 150* (GH, MU, S, US); Cerro de Tecpam, *Standley 60992, 61030, 61105* (F), *61048* (F, NY). EL PROGRESO: between Calera and summit Volcán Siglo, *Steyermark 43090* (F). HUEHUETENANGO: Cruz de Limon, between San Mateo Ixtatan and Nuca, Sierra de los Cuchumatanes, *Steyermark 49854* (F). QUEZALTENANGO: mts. se. Palestina, *Standley 66331* (F); Volcán de Santa Maria, above Palojunoj, *Standley 67577, 67591, 67629* (F). SAN MARCOS: between San Marcos and Serchil, *Standley 85436* (F); between San Sebastian at km. 21 and km. 8, 8–18 mi. nw. San Marcos, *Steyermark 35628* (F, NY). SOLOLA: Volcán Atitlan, *Kellerman 5839* (US); Volcán Santa Clara, *Steyermark 46995* (F). TOTONICAPAN: region of Chiu Jolom, mts. above Totonicapan, on road to Desconsuelo, *Standley 84476* (F).

COSTA RICA: CARTAGO: Cordillera de Talamanca, near El Copey, *Williams & Allen 16524* (T).

PANAMA: without definite locality, *Seemann 2133* (BM, K).

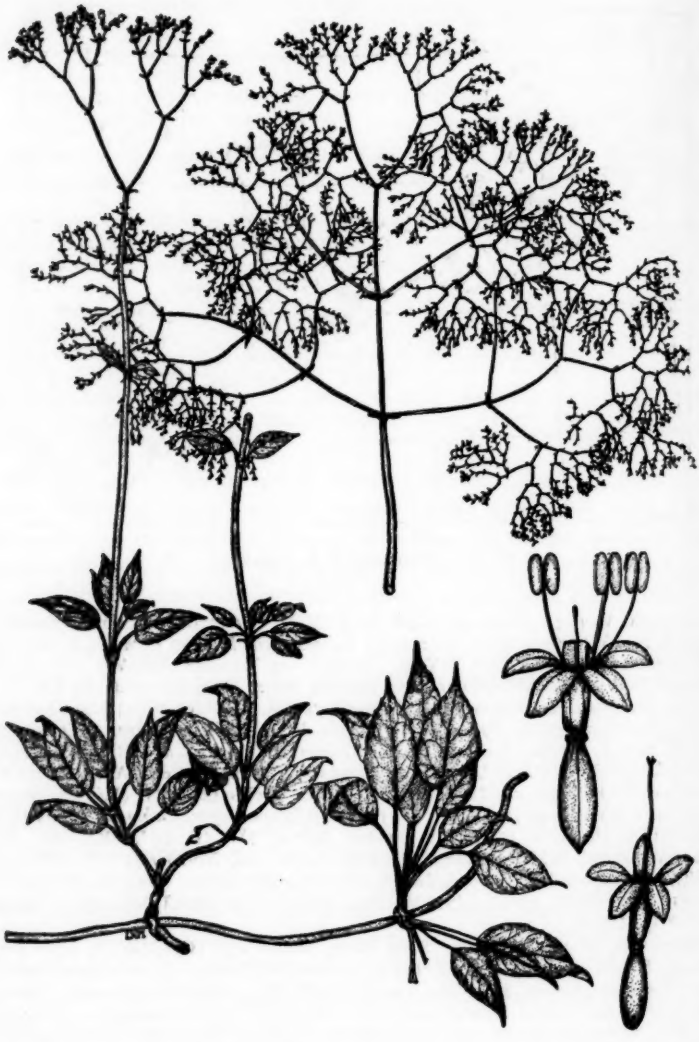

Fig. 25. *Valeriana clematitis:* Habit, × ⅓; staminate and pistillate flower, × 7.

The voluble and clambering habit, and the undivided, elliptic to ovate or suborbicular leaves are the most useful characters upon which to distinguish *V. clematitis*. This species stands apart from the remaining four species in series

CLEMATITES, and to interpret variation is a matter of giving the proper weight to infraspecific variants. The variability is not difficult to interpret when this taxon is viewed over its total distribution. The names in synonymy include essentially several of the biotypes which occur within the normal variation pattern of this taxon. For instance, *V. laurifolia* of Kunth is a common form with glabrous and thicker leaves than typical *V. clematitis* from northern South America. In central America this form was recently described as *V. laxissima* by Standley and Williams. Variation in *V. clematitis* concerns, for the most part, differences in leaf texture, degree of pubescence, and the variable aspect of the ovate-acuminate leaf.

16. VALERIANA SELERORUM Graebn. & Loesn. in Verhandl. Bot. Ver. Brandenburg 53:86. 1912. T.: *Seler 1335!* (F, MO photo).

Valeriana Arsenei Briq. in Ann. Conserv. & Jard. Bot. Genève 17:340. 1914. T.: *Arsène s. n.!* (D, F, MO photo).

Annuals 2.6–10.0 dm. tall, slender, from subnapiform tap-roots 3–7 mm. thick. *Stem* moderately leafy, 0.2–1.0 cm. in diameter, glabrous or scattered-pilose, pilosulous in a line on the upper portion, diminishing below. *Leaves* cauline, 2–7 pairs, undivided, 4.5–24.0 cm. long, the petioles generally exceeding the length of the blade, 2.5–17.0 cm. long, spreading-ciliate, the uppermost sessile, the blades 2–7 cm. long, 2.9–8.5 cm. wide, broadly ovate to suborbicular, cordate, obtuse, 3.6–23.0 cm. long, crenate to dentate or essentially entire, light green to somewhat glaucous below, green above, uniformly spreading-hirtellous especially above, more or less restricted to the veins below, the margins often opaque, spreading-ciliate. *Inflorescence* a compound dichasium, the terminal dichotomies 1.2–3.2 cm. wide in anthesis, later diffuse and 6–10 cm. wide, the nodes and internodes glabrous, sometimes densely pilosulous in a line; bracts 5–6 mm. long, reduced above, glabrous or occasionally spreading-ciliate; flowers hermaphroditic. *Corolla* campanulate-infundibuliform, 2.8–3.5 mm. long, lavender, glabrous without, the lobes less than half the length of the gibbous tube, the throat sparsely pilosulous within. *Stamens* and style exserted. *Achenes* oblong-linear, ampulliform and undulate-falcate, truncate at the base, 2.9–3.5 mm. long, 1.1–1.5 mm. wide, glabrous on the abaxial, pilosulous in 2 lines adjacent the midrib on the adaxial side. *Calyx-limb* 10- to 12-fid.

TYPE LOCALITY: Michoacán, Dist. Pátzcuaro, Mexico.

DISTRIBUTION: South-central Mexico, 6200-8200 feet altitude. Flowering and fruiting August and September.

MEXICO: DURANGO: Coyotes Hacienda, 63 mi. w. sw. C. Durango, *Maysilles 7481a* (MU). MEXICO: Dist. Temascaltepec, Tequesquipan, *Hinton 1342* (GH, K, US); Dist. Temascaltepec, Rincón, *Hinton 4646* (K, MO); Dist. Temascaltepec, Nanchititla, *Hinton 4712* (GH, K). MICHOACÁN: vicinity of Morelia, Cerro Azul, *Arsène 2455* (MO, S, US); vicinity of Morelia, Rincón, *Arsène 5482* (MO, US); Morelia road, *Kenoyer A359* (F); Ignatio, *Seler 1335* (F, MO photo).

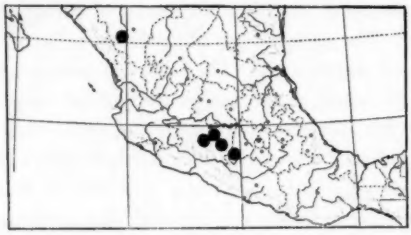

Fig. 26. Distribution of *V. Selerorum*.

Valeriana Selerorum may be distinguished by the pubescence on the stem, which is disposed in a line on the upper portion, the broadly ovate to suborbicular and cordate leaves, the campanulate-infundibuliform corolla, the oblong-linear, ampulliform and undulate-falcate achenes, and the compound dichasial inflorescence. This species is most closely related to *V. urticaefolia*, with which it is most frequently confused, mainly on the similarity of leaf shape. However, *V. Selerorum* may be consistently distinguished from *V. urticaefolia* on inflorescence and achene characters alone.

17. VALERIANA URTICAEFOLIA HBK. Nov. Gen. et Sp. 3:330. 1819. T.: *Humboldt & Bonpland 2093!* (MO, P).

Valeriana scorpioides DC. Prod. 4:635. 1830. T.: *Berlandier 1133!* (BM, D, G, MO).
Valeriana erysimoides Poepp. & Endl. Nov. Gen. et Sp. 3:16. 1844. T.: *Poeppig 1670!* (MO photo, W).
Valeriana rhomboidea Greene, Pittonia. 1:154. 1888. T.: *Forrer s. n.!* (F, GH, NY, UC, US).
Valeriana Sallei Briq. in Ann. Conserv. & Jard. Bot. Genève 17:339. 1914. T.: *Sallé 71!* (D).

Annuals 1.3–7.5 dm. tall, slender, from subnapiform tap-roots 3–8 mm. thick. *Stem* moderately leafy, unbranched or sometimes branched, 0.5–4.0 mm. thick, minutely puberulent to densely spreading-pilosulous towards the base, glabrescent above. *Leaves* cauline, 3–7 pairs, sessile or short-petiolate, undivided, ovate to oblong-elliptic to suborbicular, sometimes more or less flabelliform, acute to obtuse, 0.9–9.2 cm. long, serrate to crenate, dentate to repand or essentially entire, uniformly spreading-pilosulous especially above, sometimes more or less restricted to the veins below, blades more or less abruptly expanded, 0.7–5.0 cm. long, 0.7–4.5 cm. wide; petioles 0.2–6.0 cm. long or obsolete, rarely exceeding the blades in length, uniformly spreading-pilosulous. *Inflorescence* an aggregate or sometimes compound dichasium, 2–28 cm. long in anthesis, later diffuse and 13–60 cm. long, 7–28 cm. wide, the terminal scorpioid sympodia 2–6 cm. long, bracts 1–2 mm. long, glabrous; flowers hermaphroditic. *Corolla* infundibuliform to subsalverform, 1.8–5.0 mm. long, white to pinkish, glabrous without, the tube abruptly narrowing and often somewhat filiform towards the base, the lobes less than half the

length of the gibbous tube, the throat sparsely pilosulous without. *Stamens* and style exserted. *Achenes* oval to suborbicular, somewhat fabriliform (bellows-shaped), with 2 peripheral and 1 median abaxial vein, subarcuate, minutely papillate, yellowish to purplish maculate, 1.2–2.0 mm. long, 0.9–1.1 mm. wide, glabrous or sometimes densely hirtellous on the adaxial side, glabrous on the abaxial side, the midribs prominent. *Calyx-limb* 10- to 13-fid.

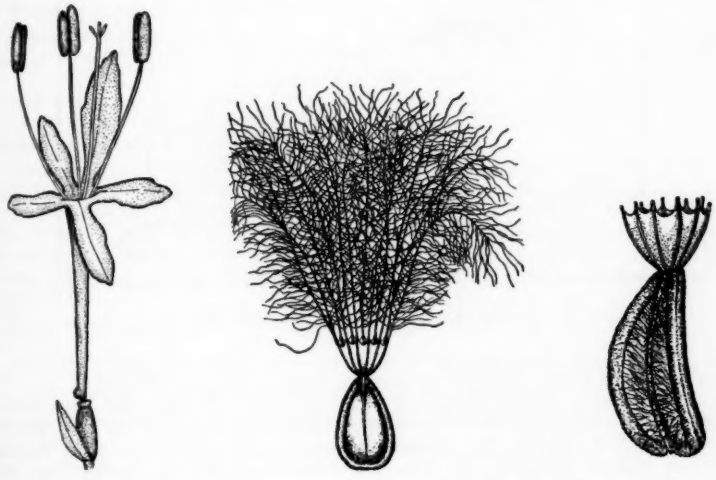

Fig. 27. *Valeriana urticaefolia*: Flower, × 5; achene with plumose calyx segments, × 7; achene (abaxial view), × 14.

TYPE LOCALITY: "Crescit in frigidis Novo-Granatensium, prope Almaguer et convallem Guaytarensem; item juxta urbem Loxae Peruvianorum, alt. 1000–1200 hex."

DISTRIBUTION: Open oak or pine woods, dry sunny hillsides, grassy slopes and fields in loose granitic conglomerate or calcareous soil, 2600–10000 ft. alt. Mexico to Panama; also in the Andes to Peru and Argentina.

MEXICO: CHIAPAS: Mt. Ovando, *Matuda 2187* (MU); Mt. Tacana, *Matuda 2491* (F, G, MO, MU, NY); Siltepec, *Matuda 4106* (GH, MU, NY); Hacienda Monserrate, *Purpus 9165* (GH, MO, NY, UC, US). CHIHUAHUA: 65 mi. e. Batopilas, *Goldman 187* (GH, NY, US). DURANGO: Sierra Madre w. Durango, *Forrer s. n.* (F, GH, NY, UC, US); El Salto, *Pennell 18337* (US). FEDERAL DISTRICT: Cañada de Eslava, *Lyonnet 357* (GH, MO, NY, US); Cerro Magdalena, Serrania de Ajusco, *Lyonnet & Elcoro 1906* (US); Eslava, *Pringle 9365* (GH, NY, US); Tlalpam, *Salazar s. n.* (US). GUERRERO: Dist. Mina, Manchon-Arroyo Hondo, *Hinton 9412* (GH); Dist. Mina, Chiriagua, *Hinton 9846* (GH); Dist. Mina, Pilas, *Hinton 10701* (GH); Dist. Mina, Campo Morado, *Hinton 11167* (GH); Dist. Montes de Oca, Vallecites, *Hinton 11335* (GH); Dist. Galeana, Plan del Carrizo, *Hinton 14664* (F, GH, MO, NY); Dist. Mina, Petlacala, *Mexia 8978* (F, GH, MO, NY, S, US); ne. Chilpancingo on road to Chilapa, *Moore & Wood 4658* (MO). HIDALGO: Real del Monte, *Berlandier 494* (D). JALISCO: e. San Sebastian, Arroyo de Santa Gertrudis, *Mexia 1512* (F, GH, MO, MU, NY, UC); W. Bolanos, *Rose 2963* (US);

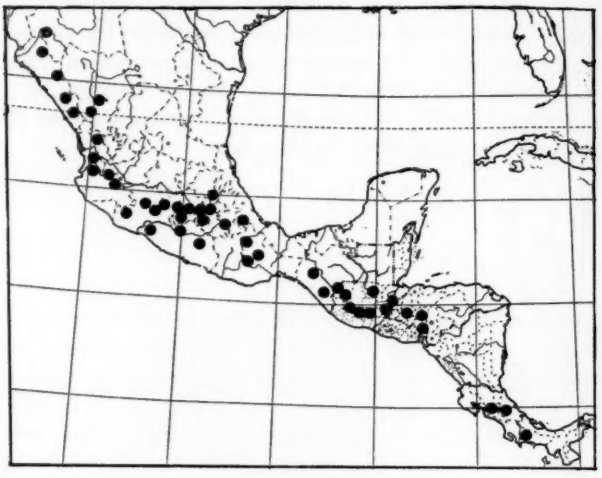

Fig. 28. Distribution of *V. urticaefolia.*

Etzatlan, *Rose & Painter 7556* (US). MEXICO: Volcán Toluca, *Heller 438* (P, STR, W); Dist. Temascaltepec, Cucha, *Hinton 1677* (D, GH, MO, NY, US); Dist. Temascaltepec, Pantoja, *Hinton 2849* (D, GH, NY); Flor de Maria, *Pringle 3234* (BM, E, F, GG, GH, K, MO, NY, P, S, UC, US, W); Ixtaccihuatl, *Purpus 1781* (F, GH, MO, NY, UC, US); Vallée de Mexico, *Schaffner 194* (P). MICHOACÁN: vicinity of Morelia, Cerro Azul, *Arsène 2458* (K, NY, P); vicinity of Morelia, Cerro de las Nalgas, *Arsène 2563* (MO, NY, S, US); vicinity of Morelia, Ravin Santa Maria, *Arsène 3105* (MO, NY, S, US); vicinity of Morelia, Cerro San Miguel, *Arsène 5208* (MO, US); vicinity of Morelia, Loma Santa Maria, *Arsène 5424* (GH, MO, NY, S, US); vicinity of Morelia, Ouest del Zapote, *Arsène 9396* (MO); Anganguio, *Hartweg 300* (CGE, FI, G, K, NY, OXF, P, W); Dist. Coalcomán, Pte. Las Cruces, *Hinton 12189* (GH, K); Dist. Coalcomán, Pto. Zarsamora, *Hinton 15040* (GH, NY); Dist. Coalcoman, Sierra Torricillas, *Hinton 15269* (GH, NY); Dist. Uruapan, Tancitaro, *Hinton 15550* (F, GH, MO, MU, NY); Morelia, *Kenoyer A358* (ARIZ, F); 7 mi. sw. Uruapan, *Leavenworth & Hoogstraal 1254* (F); Pátzcuáro, *Reiche 141* (M). MORELOS: Vallée del Tepeite, *Lyonnet & Elcoro 1839* (US); km. 56–57, road to Cuernavaca, *Moore 120* (GH); Alarcon, *Orcutt 3871* (F, MO, US); n. Cuernavaca, *Russell & Souviron 252* (US). NAYARIT: vicinity of Jalisco, *Ferris 8019* (US); road from Tepic to Jalcojotan, *Mexia 602* (D, GH, MO, MU, NY, UC, US); Tepic, *Pennell 19815* (US); between Aguacata and Dolores, *Rose 3358* (US). OAXACA: mts. above Cuicatlan, *Pringle 5630* (F); near Oaxaca, *Pringle 5630a* (US). PUEBLA: Puente del Emperador, La Venta, *Sharp 44549* (MO). SINALOA: Sierra Surotato, Ocurahui, *Gentry 6251* (GH, GENT, MO, MU, NY); El Batel to Pico del Aquila, *Mexia 461* (F, MO, UC); Cerro de las Cruces, San Ignacio, *Montes & Salazar 103* (US); Santa Lucia, east of Panuco, *Pennell 20023* (US); Cerro Quemado, ne. of Panuco, *Pennell 20143* (US). VERA CRUZ: La Joya, *Balls 5515* (BM); Orizaba, *Botteri 578* (P), *796* (GH, US); d'Orizaba Escamella, *Bourgeau 2945* (D, GH, NY, S, US); Amatlan, *Liebmann s. n.* (S).

GUATEMALA: ALTA VERA PAZ: Santa Cruz bei Cobán, *Seler 2438* (GH, NY, US); Tactic, *Tuerckheim 1570* (BR, F, GH, MO, NY, US). CHIMALTENANGO: Alameda, *Johnston 753, 945, 974* (F); plains near Tecpam, *Skutch 579* (MU, US); near Finca La Alameda, near Chimaltenango, *Standley 59121* (F, NY); barranco de la Sierra, se. Patzum, *Standley 61654* (F, NY). CHIQUIMULA: Caracol Mountain, near Quezaltepeque, *Steyer-*

mark 31383 (F). GUATEMALA: Volcán de Pacaya, above Las Calderas, *Standley 58344* (F). HUEHUETENANGO: e. San Sebastián, *Standley 81456* (F); Cerro Jolomtac, Sierra de los Cuchumatanes, *Steyermark 49496* (F); between San Sebastián H. and large peñasco above town, *Steyermark 50492* (F). JALAPA: vicinity of Jalapa, *Standley 76543* (F); between Jalapa and Paraiso, *Standley 77366* (F); between Güiziltepeque and Potrero Carillo, *Steyermark 33083* (F). SACATEPÉQUEZ: near Antigua, *Standley 58636* (F). SANTA ROSA: Estanzuela, *Heyde & Lux 3969* (GH, NY, US). SOLOLÁ: Río Bravo, slopes of Volcán Atitlan, *Steyermark 47972* (F, UC). ZACAPA: Sierra de las Minas, between Rio Hondo and summit of mt. at Finca Alejandria, *Steyermark 29646* (F); along Rillito del Volcán de Monos, *Steyermark 42307* (F).

HONDURAS: COMAYAGUA: vicinity of Siguatepeque, *Standley 56021, 56242* (F). GRACIAS: without definite locality, *Hjalmarson s. n.* (S). MORAZÁN: Santa Ines, *Valerio 452* (F); Uyuca, *Valerio 575, 649, 744, 936, 1492, 2153* (F); Piedra Herrada, Cerro de Uyuca, *Standley 11988* (F); vicinity Hoya Grande, *Williams & Molina 10179* (F); La Montañita, *Williams & Molina 10553* (F, MO, UC); near Siguatepeque, *Yuncker, Dawson, Youse 5857* (F, GH, MO, MU, NY, S, US).

COSTA RICA: ALAJUELA: San Piedades near San Ramón, *Brenes 4434* (F); Cerros de San Rafael de San Ramón, *Brenes 5897* (F); alto de Acosta de San Ramón, *Brenes 16667* (F); Palmira, region of Zarcero, *Smith 270* (F); Palmira, Alfaro Ruiz, *Smith 1294* (F, NY). CARTAGO: Las Concavas near Cartago, *Cooper 65* (F); chemin á Cartago, *Tonduz 2930* (US). SAN JOSE: Cerro de Piedra Blanca, above Escasú, *Standley 32613* (US); between Aserri and Tarbaca, *Standley 34077* (US); plantations de cafe d'Aserrí, *Tonduz 1273* (US).

PANAMA: CHIRIQUÍ: Bajo Mona, Boquete Dist., *Terry 1300* (F, GH, MO).

Valeriana urticaefolia exhibits relatively little variation throughout the distribution, being readily distinguished by the undivided leaves, oval to suborbicular and somewhat fabriliform (bellows-shaped) achenes, and the narrowly infundibuliform corolla. These characters consistently mark *V. urticaefolia*, and it does not seem likely that subspecific taxa exist within *V. urticaefolia*, at least in Mexico and Central America. I have not studied the South American material of this species to any extent, but the specimens from Ecuador and Peru match those from North America very satisfactorily.

18. VALERIANA CUCURBITIFOLIA Standl. in Field Mus. Publ. Bot. 22:58. 1940. T.: *Matuda 1709!* (F, GH, MAT, MO photo, MU, NY).

Valeriana cacalioides Standl. *l. c.* 125. 1940. T.: *Matuda 1812!* (F, GH, K, MAT, MO photo, MU, NY).

Perennials 6.8–13.0 dm. tall, robust, from stout, more or less elongated roots at least 1.3–1.5 cm. thick, lower portion unknown; caudex covered with a succession of imbricate, marcescent, brownish and chartaceous leaf bases and petioles of previous seasons. *Stem* moderately leafy, 2–9 mm. in diameter, glabrous or spreading-pilosulous throughout, the nodes consistently pilosulous. *Leaves* predominantly basal, 25–30 cm. long, rather closely imbricate, forming a loosely tufted rosette, petiolate, undivided or sometimes with 1 pair of lateral lobes, the blades and terminal lobe of the divided leaves abruptly expanded, reniform-cordate to cordate, 5–15 cm. wide, irregularly and often deeply dentate to repand-dentate,

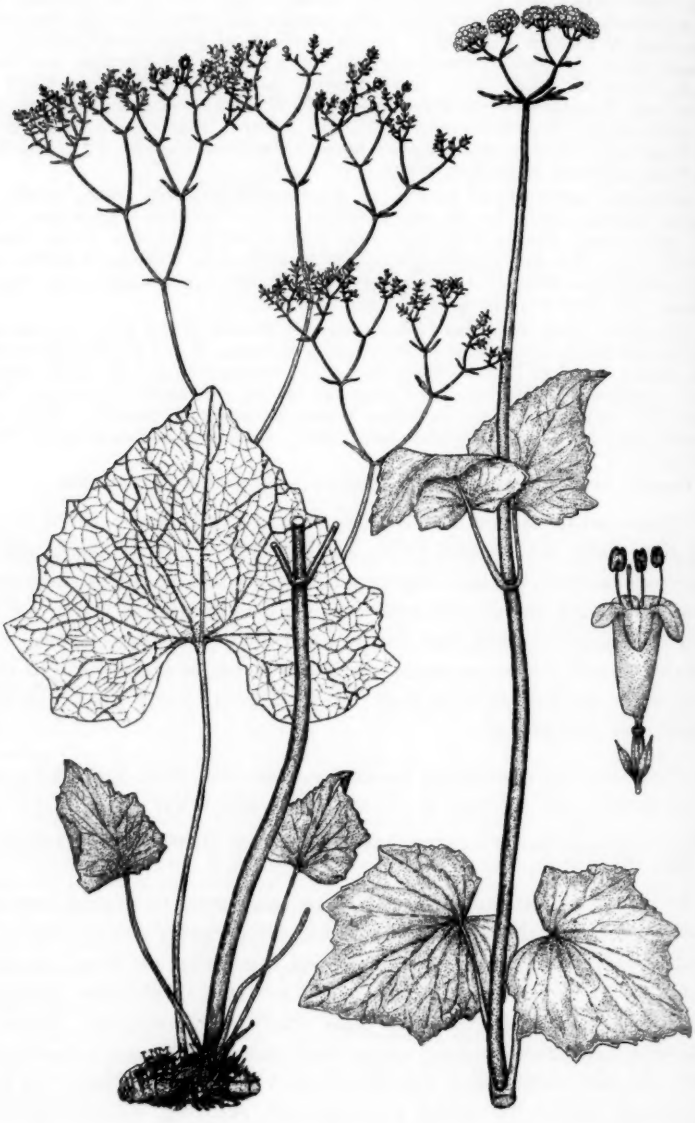

Fig. 29. *Valeriana cucurbitifolia*: Habit, × 1/3; flower, × 8.

light green to somewhat glaucous below, green above, uniformly spreading-pilosulous or more or less restricted to the veins above and below, spreading-ciliate, the lateral lobes petiolate, simulating the terminal lobe, somewhat smaller, 3–18 cm. long, 2–12 cm. wide; petioles usually exceeding the length of the blades, 19–40 cm. long, more or less conduplicate, glabrous to uniformly pilosulous or pubescent on the concave ventral side; cauline leaves 2–4 pairs, simulating the basal, usually smaller, 10–15 cm. long, 5.8–9.0 cm. wide, petiolate towards the base, the uppermost sessile and much reduced. *Inflorescence* a compound or rarely an aggregate dichasium, the terminal dichotomies 1.5–3.5 cm. wide in anthesis, diffuse at maturity, 7.5–15.0 cm. wide, the nodes and internodes hirtellous; bracts 6–9 mm. long, reduced above, glabrous or occasionally spreading-ciliate; flowers hermaphroditic. *Corolla* infundibuliform, 4.0–5.5 mm. long, white, glabrous without, the lobes less than half the length of the gibbous tube, the throat sparsely pilosulous within. *Stamens* and style exserted. *Achenes* linear- to ovate-oblong, somewhat falcate, 2–4 mm. long, 1.1–1.5 mm. wide, sometimes scattered brownish-maculate, glabrous on the abaxial, uniformly short-hirtellous on the adaxial side, abaxial ribs rather prominent. *Calyx-limb* 10- to 14-fid.

TYPE LOCALITY: Toblas, Siltepec, Chiapas, Mexico. August 8, 1937.

DISTRIBUTION: On limestone outcrops and bluffs, 6000–10000 ft. alt., southern Chiapas to Guatemala. Flowering and fruiting April to August.

MEXICO: CHIAPAS: Toblas, Siltepec, *Matuda 1709* (F, GH, MAT, MO photo, MU, NY); Mt Ovando, *Matuda 1812* (F, GH, K, MAT, MO photo, MU, NY); Ventana, near Siltepec, *Matuda 4539* (MAT, NY); Mt. Male, near Porvenir, *Matuda 4602* (F, G, MAT, MO, NY).

GUATEMALA: HUEHUETENANGO: Cumbre Papal, on bluffs between summit and La Libertad, *Steyermark 50966* (F).

Valeriana cucurbitifolia has only been known for little over a dozen years, although it is so distinctive there should be no mistaking its identity. This species stands apart from its congenors in series CLEMATITES by the large reniform to cordate leaves which are from 5–15 cm. wide. Its relationship would appear to be closest to *V. palmatiloba*.

Fig. 30. Distribution of *V. cucurbitifolia* and *V. palmatiloba*.

19. VALERIANA **palmatiloba** F. G. Mey., spec. nov.

Planta perennis 1.5–2.7 dm. alta tenuis erecta, radice ignota. Caudex usque ad 1.4 cm. diam. Caules moderate foliacei 1–2 mm. diam. sive glabri sive patenti-pilosuli, nodis pilosulis. Folia basilaria plerumque petiolata simplicia vel 3-partita, laminis simplicium et lobis terminalibus ternatorum 5- vel 7-lobatis acutis aliquid hastatis vel cordatis 2.0–7.5 cm. longis 1.8–3.4 latis parce dentatis patenti-hirtellis praecipue ad venas restrictis patenti-ciliatis, lobis lateralibus distinctis quam lobo terminali multo brevioribus 1.0–1.7 cm. longis brevi-petiolatis; petiolis 3.6 cm. longis, foliis caulinis 2–3 jugis folia basilaria simulantibus 3–5 cm. longis petiolatis superne multo reductis sessilibusque. Inflorescentia aggregatum aut compositum dichasium 1.5 cm. lata in anthesim nodis et internodiis hirtellis, bracteis 4–6 mm. longis superne reductis glabris aut aliquid patenti-ciliatis, floribus hermaphroditicis. Corolla infundibuliformis usque ad 4 mm. longa alba extra glabra, tubo gibbo lobis duplo vel plus longiori, faucibus intus parce vel dense pilosulis. Staminae et styla exserti. Achaeniae latere abaxiali glabrae latere adaxiali brevi-hirtellae. Calycis limbus in specimine nostro immaturus.

Known only from the type collection. Flowering in May.

MEXICO: CHIAPAS: open forest, mountains near Fenia, *Purpus 419* (US, HOLOTYPE).

Although the type specimen is immature, it is sufficiently well developed to indicate its distinctness from *V. cucurbitifolia*, to which it is related. *V. palmatiloba* is distinguished by the palmately 5- to 7-lobed and pubescent leaves. This species occurs within the range of *V. cucurbitifolia*, and additional material of both species would be very helpful in clearing up the relationships of these taxa.

Series V. DENSIFLORAE F. G. Mey., n. ser.

Perennials or annuals from napiform to fusiform tap-roots. *Stem* leafy or subscapose, unbranched to the inflorescence, glabrous or uniformly pubescent. *Leaves* cauline or basal, petiolate, pinnate to pinnatifid or bipinnatifid, rarely undivided, elliptic- or oblanceolate- to obovate-spatulate, or ovate-cordate, (bract-like in *V. vaginata*), serrate to dentate or repand, entire or essentially so, glabrous or spreading-pilosulous, especially on the veins. *Inflorescence* an aggregate or compound dichasium; flowers hermaphroditic, polygamo-dioecious or dioecious. *Corolla* infundibuliform, glabrous or spreading-pilosulous without, the tube gibbous, the throat scattered-pilosulous within. *Stamens* and style exserted, anthers 2-lobed, the thecae entire, the loculae equal in length. *Achenes* predominantly suborbicular or ovate-oblong, sometimes more or less ovoid, uniformly dense-pilosulous to short-sericeous or glabrous, abaxial side convex or strongly keeled. *Calyx-limb* 6- to 12-fid or obsolete. Species, 5.

TYPE SPECIES: *Valeriana densiflora* Benth.

DISTRIBUTION: Mexico, except *V. pulchella* which occurs also in Costa Rica and Panama.

The species of this assemblage usually possess well-developed napiform tap-roots. The leaves are usually pinnate to pinnatifid. The achenes are often densely hirtellous to subsericeous.

Fig. 31. *Valeriana palmatiloba*: Habit, × ½; flower, × 5. Drawn from type specimen.

KEY TO THE SPECIES

A. Inflorescence an aggregate dichasium, paniculiform. Achenes merely convex abaxially.
  B. Leaves pinnate-bipinnatifid. Inflorescence bracts spreading-ciliate. Achenes suborbicular to subovoid, 0.7–1.0 mm. long, spreading-pilosulous. Calyx-limb 5- to 6-fid or obsolete. Sonora and Chihuahua to Jalisco ..... 20. *V. apiifolia*
  BB. Leaves pinnate to pinnatifid or much reduced. Inflorescence bracts glabrous. Achenes oblong-ovate to oval, 1.4–3.5 mm. long, densely hirtellous to sericeous. Calyx-limb 11- to 12-fid.
    C. Leaves much reduced, bract-like, the basal vaginate to subspathiform, the cauline clasping-patelliform. Hidalgo, Guanajuato to Mexico ..... 21. *V. vaginata*
    CC. Leaves well developed, elliptic- or oblanceolate- to obovate-spatulate, pinnate to pinnatifid or sometimes undivided. San Luis Potosi to Puebla and Guerrero ..... 22. *V. densiflora*
AA. Inflorescence a compound dichasium, dichotomous throughout. Achenes more or less strongly carinate abaxially.
  D. Leaves cauline, 2 pairs. Achenes oblong-elliptic, often rather strongly keeled, glabrous, abaxial ribs indistinct. Calyx-limb 8-fid or obsolete. Durango and Sinaloa ..... 23. *V. deltoidea*
  DD. Leaves predominantly basal, more numerous. Achenes oblong to broadly ovate, merely turgid or less strongly carinate, glabrous or hirtellous, abaxial ribs evident. Calyx-limb 11- to 12-fid or obsolete. Oaxaca to Panama ..... 24. *V. pulchella*

20. VALERIANA APIIFOLIA Gray, in Proc. Am. Acad. 22:417. 1886. T.: *Palmer 564!* (BM, GG, GH, K, MO, NY, P).

Astrephia mexicana Hook. & Arn. Bot. Beechey's Voy. 431. 1841. T.: *Lay s. n.!* (K).
Phyllactis mexicana (Hook. & Arn.) Benth. & Hook. Gen. Pl. 2:154. 1873.

Annuals 2.3–5.0 dm. tall, slender, from subnapiform tap-roots 4–7 mm. thick, sometimes forked. *Stem* leafy, 0.5–2.0 mm. in diameter, minutely puberulent throughout. *Leaves* cauline, 4–6 pairs, disposed mostly on the lower half of the stem, petiolate, pinnate-bipinnatifid, rarely undivided, ovate, usually more or less ovate-cordate, acuminate, 2.0–7.5 cm. long, 1.4–5.9 cm. wide, glabrous or sometimes spreading-pilosulous mostly above, glabrescent below, the lateral lobes 3–5 pairs, the longest pair distinct, short-petiolate, abruptly expanded, acuminate, rather deeply lobed or cleft, the succeeding lobes more or less decurrent on the rhachis, ultimately 3- to 5-cleft; petioles 1.3–4.0 cm. long, more or less conduplicate, glabrous or pilosulous to minutely puberulent, frequently restricted to the concavity. *Inflorescence* an aggregate dichasium, 15–45 cm. long, more or less heliciform in anthesis, the terminal scorpioid branches later 1.0–2.7 dm. long, bracts 1.0–1.2 mm. long, relatively long spreading-ciliate; flowers polygamodioecious. *Corolla* infundibuliform, of the perfect and staminate flower 2.5–4.0 mm. long, of the pistillate 0.9–1.5 mm. long, white, glabrous or spreading-pilosulous without, the lobes less than half the length of the gibbous tube, the throat sparsely pilosulous within. *Stamens* and style exserted. *Achenes* suborbicular to subovoid, 0.7–1.0 mm. long, tawny or becoming brownish maculate, spreading-pilosulous. *Calyx-limb* 5- to 6-fid or obsolete.

TYPE LOCALITY: Río Blanco, 10 mi. west by north of Guadalajara, Jalisco, Mexico.

Fig. 32. *Valeriana apiifolia:* Habit, × 1/31; mature achenes (adaxial side), those with dentate calyx above, those with plumose segments below, × 13; flower and scorpioid branch of the inflorescence, × 5.

DISTRIBUTION: Moist shady oak or pine-covered mountain sides, canyon slopes, 3500–5500 ft. alt. Sonora, Chihuahua to Jalisco, Mexico. Flowering and fruiting September to January.

MEXICO: CHIHUAHUA: Sierra Charuco, Río Fuerte, *Gentry 1757* (F, GENT, GH, MO, UC); Guicorichi, Río Mayo, *Gentry 1976* (F, GENT, MO, US); near Batopilas, *Goldman 231* (GH, NY, US). DURANGO: Sierra Tres Picos, *Gentry 5318* (GENT, GH, MO, MU, NY, US); Sianori, *Ortega 5326* (US). JALISCO: Río Blanco, *Palmer 564* (GH, MO, NY); near Guadalajara, *Pringle 1768* (D, F, GH, NY, UC, US). NAYARIT: Tepic and San Blas, *Lay s. n.* (K). SINALOA: Quebrado de Mansana, Sierra Surotato, *Gentry 6563* (GENT, GH, MU); Balboa, *Ortega 5016* (US). SONORA: Sagauribo, Río Mayo, *Gentry 2105* (F, GENT, GH, MO, UC, US). SONORA-CHIHUAHUA boundary: La Mesa Colorado, *Gentry 532m* (MU); Cañon de Rasnos, *Gentry 597m* (MU).

Valeriana apiifolia may be readily distinguished by the cordate, ovate-acuminate, pinnate to bipinnatifid leaves, and small, 0.7–1.0 mm. long, subovoid achenes with the calyx-limb 5- to 6-fid or merely dentate. The heliciform inflorescence and bipinnatifid leaves further distinguish this species from all others in series DENSIFLORAE.

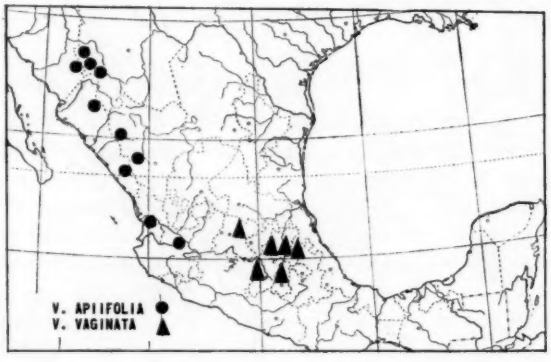

Fig. 33. Distribution of *V. apiifolia* and *V. vaginata*.

21. VALERIANA VAGINATA HBK. Nov. Gen. et Sp. 3:331. 1819. T.: *Humboldt & Bonpland s. n.!* (MO photo, P).

Valeriana denudata Benth. Pl. Hartw. 20. 1839. T.: *Hartweg 150!* (BM, CGE, G, GH, K, NY, P, W).

Perennials 0.6–5.0 dm. tall, from smooth to verrucose napiform tap-roots 1–4 cm. thick; caudex covered with a succession of imbricate, marcescent, brownish, chartaceous leaf bases of previous seasons. *Stem* subscapose, unbranched to the

Fig. 34. *Valeriana vaginata:* Habit and single inflorescence, × ½; flower, × 8; achene (abaxial side), × 7.

inflorescence, 1.0–3.5 mm. in diameter towards the base, glabrous. *Leaves* much reduced, bract-like, the basal 1- to several, rather closely imbricate, vaginate to subspathiform, more or less conduplicate, obtuse or acuminate, 1.3–6.0 cm. long,

glabrous; cauline leaves clasping-patelliform, 1.3–3.5 cm. long, 2- to 4-parted, the divisions 0.6–1.5 cm. long, glabrous without, spreading-ciliate towards the base of the sinus, sometimes hirtellous within. *Inflorescence* an aggregate dichasium, 1.0–2.8 cm. long, 1.3–2.0 cm. wide in anthesis, later diffuse, 3–15 cm. long, 3–6 cm. wide, the nodes puberulent, the internodes glabrous; bracts 5–7 mm. long, reduced above, glabrous; flowers hermaphroditic. *Corolla* infundibuliform, 3–6 mm. long, white to pinkish, glabrous without, the lobes approximately half the length of the gibbous tube, the throat sparsely pilosulous within. *Stamens* and style exserted. *Achenes* ovate-oblong to suborbicular, 2.2–3.3 mm. long, 1.5–2.0 mm. wide, uniformly hirtellous to short-sericeous. *Calyx-limb* 11-fid.

TYPE LOCALITY: "Crescit locis humidis Regni Novae Hispaniae, prope Real del Monte [Hidalgo], alt. 1430 hex. Floret Majo." The locality on the type specimen is, "Moran". In his resumé of the Mexican journey of Humboldt, Sprague (Kew Bull. 20–27. 1924) relates, "Moran (Real de Moran) el. 7986 ft. May–June 1803—between Mexico City and Actopan in the State of Hidalgo".

DISTRIBUTION: Dry grassy hills, Sierra Madre Oriental, 8000–10000 ft. alt. Flowering and fruiting April and May.

MEXICO: FEDERAL DISTRICT: Serrania de Ajusco, *Pringle 6858* (BM, D, E, F, GG, GH, K, MO, NY, P, UC, US, W, WYO). GUADALAJARA: Ferreria, Tapalpa, *Jones s. n.* (POM). GUANAJUATO: *Hartweg 150* (BM, CGE, G, GH, K, NY, P, W). HIDALGO: Moran (Real de Moran), between Mexico City and Actopan, *Humboldt & Bonpland s. n.* (MO photo, P); El Chico, *Lyonnet 731* (GH, MO, NY, US); Trinidad, *Pringle 13479* (US). MEXICO: Dist. Temascaltepec, Las Cruces, *Hinton 608* (GH). MICHOACÁN: Morelia, Cerro Azul, *Arsène s. n.* (D).

Valeriana vaginata may be readily distinguished by the nearly naked stem and the much-abbreviated vaginate to subspathiform leaves. The vaginate leaves are the most reduced of any North American species of *Valeriana*.

22. VALERIANA DENSIFLORA Benth. Pl. Hartw. 39. 1839. T.: *Hartweg 301!* (CGE, D, FI, K, NY, OXF, P, W).

Perennials 1.1–9.0 dm. tall; tap-roots simple or forked, napiform or fusiform, 0.6–3.5 cm. thick, subligneous to somewhat fleshy, smooth or becoming transversely rugose in age. *Stem* subscapose or leafy, 1–6 mm. in diameter, sparsely pilosulous to short-pilose especially towards the base, or glabrous, the nodes consistently pilosulous; subterranean stem 1–17 cm. long or obsolete. *Leaves* basal or cauline, the basal sometimes forming a loose rosette with the foreshortened internodes, petiolate, pinnate to pinnatifid or sometimes undivided, elliptic-, oblanceolate- to obovate-spatulate, 4–26 cm. long, irregularly dentate to repand, entire or essentially so, glabrous, the terminal lobe oval to suborbicular, 1.1–5.0 cm. long, 0.5–4.7 cm. wide, acute or obtuse, the lateral lobes 1–6 pairs or obsolete, distinct or somewhat decurrent on the rhachis, simulating the terminal lobe, grading smaller; petioles 2.5–11.5 cm. long, glabrous or spreading-ciliate; cauline leaves 2–4 pairs, the lowermost petiolate, pinnate to pinnatifid, elliptic- to obovate-spatulate, 2.5–12.5 cm. long, the terminal lobe linear, elliptic to suborbicular, acute or obtuse,

1.2–5.0 cm. long, 0.5–4.7 cm. wide, serrate to dentate or entire or essentially so, glabrous or spreading-hirtellous or more or less restricted to the veins, the lateral lobes 2–5 pairs, distinct or somewhat decurrent on the rhachis, simulating the terminal lobe, grading smaller; petiole 1–3 cm. long, glabrous, or occasionally spreading-ciliate towards the base, or uniformly spreading-puberulent. *Inflorescence* an aggregate or compound dichasium, the terminal dichotomies 1–4 cm. wide in anthesis, later diffuse, 1.3–70.0 cm. long, 2.5–20.0 cm. wide, the nodes uniformly tufted-pilosulous, spreading to the internodes or glabrous; bracts 0.5–1.4 cm. long, reduced above, glabrous; flowers hermaphroditic, gynodioecious or dioecious. *Corolla* infundibuliform, those of the perfect flower 2.3–6.0 mm. long, of the staminate 1.8–3.0 mm. long, of the pistillate 1.2–1.5 mm. long, white to pink, glabrous without, the lobes usually less than half the length of the gibbous tube, the throat pilosulous within. *Stamens* and style exserted. *Achenes* linear- to ovate-oblong or oval, 1.4–3.0 mm. long, 0.9–1.8 mm. wide, uniformly hirtellous to subsericeous or glabrous, sometimes brownish-maculate, abaxial ribs indistinct or evident. *Calyx-limb* 11- to 12-fid.

Valeriana densiflora is interpreted as a polytypic complex, and despite the efforts to pigeon-hole the several classes of variants, the only logical recourse, in view of the restrictions imposed by a paucity of material, has been to group the variants into two varieties, *densiflora* and *affinis*. As used here, this category is provisional, and its chief usefulness lies in pointing out segregating and more or less independent units of variation where genetic and geographic barriers may be acting potentially as the isolating mechanisms.

KEY TO THE VARIETIES

A. Leaves predominantly cauline. Flowers hermaphroditic or gynodioecious. Tap-root napiform, usually simple, 0.8–2.0 cm. thick. Subterranean stem 1–17 cm. long or obsolete. South-central Mexico.. 22a. *V. d. densiflora*

AA. Leaves predominantly basal. Flowers dioecious. Tap-root subnapiform to fusiform, usually 1- to few-branched, 0.7–1.6 cm. thick. Subterranean stem seldom apparent or if so, 2–3 cm. long. Guerrero and Oaxaca..... 22b. *V. d. affinis*

22a. VALERIANA DENSIFLORA Benth. var. DENSIFLORA.

Valeriana pilosiuscula Mart. & Gal. in Bull. Acad. Brux. 11[1]:122. 1844. T.: *Galeotti 2551!* (BR, D, P).

Valeriana retrorsa Fern. in Proc. Am. Acad. 36:502. 1901. T.: *Pringle 8454!* (BM, E, F, GG, GH, K, MO, NY, P, S, UC, US, W).

Tap-root napiform to somewhat fusiform, 0.8–2.0 cm. thick. *Stem* leafy, connecting subterranean stem 1–17 cm. long or obsolete. *Leaves* predominantly cauline, 2–4 pairs, pinnate to pinnatifid, or sometimes undivided, elliptic- to obovate-spatulate, 2.5–15.0 cm. long, the terminal lobe linear, elliptic to suborbicular, 1.2–5.0 cm. long, 0.5–4.7 cm. wide, serrate to dentate, entire or essentially so, glabrous or spreading-hirtellous mostly on the veins, the lateral lobes 1–5 pairs, distinct or somewhat decurrent on the rhachis; petioles glabrous or uniformly puberulent. *Flowers* hermaphroditic or gynodioecious, 2.3–6.0 mm. long, the

pistillate less than half as long. *Achenes* ovate-oblong to oval, 1.4–2.0 mm. long, 0.9–1.8 mm. wide, densely hirtellous to subsericeous, sometimes glabrous on the adaxial side.

TYPE LOCALITY: Anganguio (Michoacán?), Mexico.

DISTRIBUTION: On dry rocky or grassy slopes in oak or pine forests, 5000–10000 ft. alt. San Luis Potosi to Puebla and Guerrero. Flowering and fruiting June to September.

MEXICO: DURANGO: Coyotes Hacienda, 63 mi. w. sw. C. Durango, *Maysilles 7482a* (MU). FEDERAL DISTRICT: Serrania de Ajusco, *Pringle 6466* (D, F, GH, MO, NY, S, UC, US); Pedregal, *Pringle 7315* (GH); Eslava, *Pringle 9466* (GH, MO, NY, US); Contreras, *Orcutt 3642* (F); in montosis Tolluca, *Sartorius s. n.* (US); below Llano Grande Gap, near Rio Frio, *Sharp 4475* (MO); 55 km. se. Mexico City, *Weaver 729* (GH). GUERRERO: Vallecitos, Montes de Oca, *Hinton 10309* (K); Dist. Mina, Aquazarca-Filo, *Hinton 10448* (GH, K); Dist. Mina, Aquazarca, *Hinton 10474* (GH, K); Dist. Mina, Chilazayote-Carrizal, *Hinton 14386* (GH); Dist. Zimapán, Barranca de Taleman, Zimapán to Mina Loma del Toro and Balcones, *Moore & Wood 4392* (MO). JALISCO: La Palma, *Jones 237* (MO, US); Sierra Madre w. of Bolanos, *Rose 3718* (US); e. Mamantlán, *ca.* 15 mi. s.se. Autlán, *Wilbur 1826* (MO,MU); *ca.* 11 mi. s.sw. Autlán towards La Resolana, *Wilbur 1608* (MO,MU). MEXICO: Tepalcatitle, *Lyonnet 332* (GH,MO,NY,US); Dist. Temascaltepec, Carboneras, *Hinton 894* (NY); Dist. Temascaltepec, Volcán, *Hinton 981* (GH); Dist. Temascaltepec, El Crucero, *Hinton 1097* (F,MO); Dist. Temascaltepec, Cerro Muñeca, *Hinton 1368* (F,GH,MO,US); Dist. Temascaltepec, Ypericones, *Hinton 4164* (GH); Dist. Temascaltepec, Las Cruces, *Hinton 4395* (D,GH,MO); Dist. Temascaltepec, Temascaltepec, *Hinton 7951* (GH); Cuajimalpa, *Lyonnet 493* (GH, MO, NY, US); Monte de Rio Frío, km. 49, road from Mexico City to Puebla, *Mexia 2691* (F, MU, UC); Sierra de las Cruces, *Pringle 4210* (BM, E, F, GG, GH, K, MO, MU, NY, P, S, UC, US, W). MICHOACÁN: vicinity of Morelia, Cunicho, *Arsène 3500* (US); Morelia, Trapeo, *Arsène 6667* (US); vicinity of Morelia, Loma Santa Maria, *Arsène 9876* (US); Anganguio, *Hartweg 301* (CGE, D, FI, K, NY, OXF, P, W); Dist. Zitácuaro, Laureles, *Hinton 11998* (GH, K); Dist. Coalcomán, Sierra Torricillas, *Hinton 15004* (GH, NY, UC); from Pátzcuaro to Tacámbaro, *Moore & Wood 3997* (MO); near Lake Pátzcuaro, *Pringle 4121* (D, F, GH, MO, NY, S, UC, US, WYO). MORELOS: Sierra de Tepoxtlan, *Pringle 8454* (BM, E, F, GG, GH, K, MO, NY, P, S, UC, US, W). OAXACA: without definite locality, *Ghiesbreght 179* (P). PUEBLA: vicinity of Puebla, Cerro Tepoxuchil, *Arsène 5176* (D, F, MO, US); Puente del Emperador near La Venta, *Sharp 44360* (MO); near Río Otlati, 72 km. se. Mexico City, *Weaver 952* (GH). SAN LUIS POTOSI: without definite locality, *Virler s. n.* (P).

Variation in *V. d. densiflora* may be accounted for, in part, under the following list of variants:

1. *Plants* comparatively robust. *Stem* connecting with the napiform tap-root 1–17 cm. long, aerial portion 1.1–3.6 dm. tall. *Leaves* sometimes forming a loose rosette with foreshortened internodes, pinnate to pinnatifid or undivided, the terminal lobe oval to suborbicular, 1.6–4.0 cm. long, 1.2–4.0 cm. wide, obtuse, glabrous, entire or essentially so, the lateral lobes 1–3 pairs, grading smaller, the second and third pairs often rudimentary. *Corolla* 4–5 mm. long, with relatively short lobes and narrow tube. *Achenes* relatively small, ovate-oblong to oval, 1.5–2.0 mm. long, 0.9–1.3 mm. wide, densely hirtellous, sometimes glabrous on the abaxial side. This is *V. densiflora* of Bentham. Representative specimens: *Pringle 4210, 13021; Hinton 4395; Lyonnet 332; Weaver 729; Sharp 4475; Hartweg 301.*

2. *Leaves* cauline, the terminal lobe narrowly elliptic, only slightly dentate to entire, lateral lobes to 4 pairs. *Inflorescence* mostly pyramidal in anthesis. *Corolla* 1.3–2.9 mm. long. *Achenes* ovate-oblong, 1.7–2.0 mm. long. This variant is *V. pilosiuscula*, in part, of Martens and Galeotti. Representative specimens: *Ghiesbreght 179; Pringle 6466, 7315; Bourgeau 608; Sharp 44360.*

3. *Plants* quite slender. *Leaves* cauline, pinnate, the terminal lobe predominantly linear, 1.2–4.5 cm. long, 0.5–1.9 cm. wide, subacute or obtuse, entire or 1- to 2-dentate, the lateral lobes 3–5 pairs, often equalling the terminal lobe in length and breadth. *Corolla* and achenes simulating those under variant 1. This plant was described as *V. retrorsa* by Fernald, based on *Pringle 8454*, but without sufficient material I prefer to include it under ***V. densiflora.***

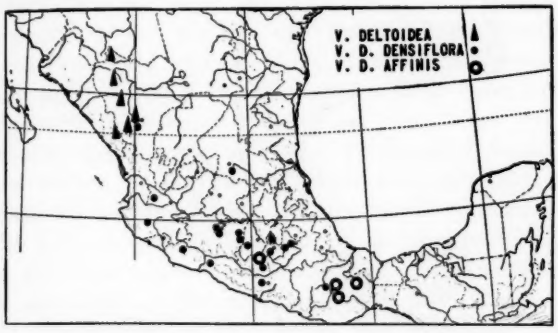

Fig. 35. Distribution of *V. densiflora* var. *densiflora*, *V. densiflora* var. *affinis* and *V. deltoidea*.

22b. VALERIANA DENSIFLORA Benth. var. **affinis** (Mart. & Gal.) F. G. Mey., stat. nov.

Valeriana affinis Mart. & Gal. in Bull. Acad. Brux. 11[1]:123. 1844. T.: *Galeotti 2555!* (BR, D, K, P, US, W).

Tap-root subnapiform to fusiform, simple or fascicular, 0.7–1.6 cm. thick. *Stem* subscapose, connecting with the tap-root at or near ground level, more or less densely pilosulous in a line on the upper portion when young, glabrescent in age; caudex covered with a succession of marcescent, brownish, chartaceous leaf bases. *Leaves* predominantly basal, usually forming a loose rosette near the base, pinnate to pinnatifid, oblanceolate- to obovate-spatulate, 7–26 cm. long, the terminal lobe linear-oblong to oval or suborbicular, 1.1–4.5 cm. long, 0.6–3.5 cm. wide, irregularly dentate, glabrous, lateral lobes 3–6 distinct pairs; petioles spreading-ciliate towards the base. *Flowers* dioecious(?), the staminate 1.8–3.0 mm. long, the pistillate 1.2–1.5 mm. long. *Achenes* elliptic to ovate-oblong, 2–3 mm. long, 1.3–1.5 mm. wide, glabrous or sometimes uniformly spreading-hirtellous.

TYPE LOCALITY: "Cerro de S. Felipe, près d'Oaxaca, de 8 à 9000 pieds", Mexico.

DISTRIBUTION: Along streams, in oak forests, and on steep mountain slopes, 9000–11000 ft. alt. South Mexico. Flowering and fruiting May to September.

Fig. 36. *Valeriana deltoides*: Habit, × ⅓; achene with plumose segments, × 5, those with dentate calyx only, × 12; flower, × 10.

Mexico: guerrero: Taxco, *Abbott 163* (GH). oaxaca: Mitla, *Andrieux s. n.* (P); nw. side of Mt. Zempoaltepec, *Nelson 644, 692* (US); Cerro San Felipe, *Pringle 4707* (D, F, GH, MO, NY, S, UC, US).

Valeriana densiflora var. *affinis* may be distinguished by the often somewhat subnapiform to fusiform tap-root, the loosely tufted basal leaves, and elliptic to oblong-ovate achenes. The populations of this variety may be geographically distinct, although the details of distribution are as yet unknown. It appears to be most closely related to *V. pulchella.*

23. Valeriana **deltoidea** F. G. Mey., spec. nov.

Planta perennis 1.5–5.4 dm. alta tenuis erecta ex radice primaria crassa subnapiformi vel fusiformi 1.5–1.8 cm. diam. Caules foliacei 0.5–2.0 mm. crassi nodis hirtellis, internodiis aut puberulis aut glabris. Folia caulina 2 jugata petiolata pinnata elliptica vel obovato-spatulata late acuta 2.2–11.5 dm. longa 2.2–7.0 cm. lata irregulariter dentata vel integra glabra, lobo terminali lineari sive oblongo-elliptico sive obovato 1.5–5.6 cm. longo 0.5–2.6 cm. lato, lobis lateralibus 2–3 jugis distinctis aut aliquid in rhachem decurrentibus lobum terminalem simulantibus; petiolis 2–3 cm. longis vel obsoletis glabris vel aliquid puberulentis. Inflorescentia dichasium compositum dichotoma terminalis ad anthesim 1.5–2.0 cm. lata deinde parce diffusa, nodis saepe puberulentis, internodiis glabris, bracteis 5–6 mm. longis superne reductis glabris, floribus hermaphroditicis. Corolla infundibuliformis 4–5 mm. longa alba vel rosea extra glabra, tubo gibbo lobis duplo vel plus longiori, faucibus intus sparse pilosulis. Stamina et styli exserti. Achaeniae oblongo-ellipticae latere abaxaliali plerumque valde carinato 2.0–3.5 mm. longae 1.0–1.5 mm. latae, glabrae aliquid fulvo-maculatae, costis abaxialibus indistinctis. Calycis limbus 8-fidus vel obsoletus.

Type Locality: "15 miles north of Guanecevi", alt. 7500–8500 ft., State of Durango, Mexico. August 17, 1898.

Distribution: Pine forests, 5400–8700 ft. alt. Durango and Sinaloa. Flowering and fruiting, August.

Mexico: durango: without definite locality, *Garcia 319, 464* (US); Metates, north of Cueva, *Pennell 18398* (US); El Salto (Aserraderos), *Pennell 18511* (US); 15 mi. n. Guanacevi, *Nelson 4760* (GH, K, US holotype). sinaloa: Cerro de la Sandia, ne. Panuco, *Pennell 20075* (US).

Valeriana deltoidea is closely related to *V. densiflora,* but it may be distinguished by the compound dichasial inflorescence, and the prominently keeled achenes which are distinctly triangular in cross-section. The calyx-limb is undivided or 8-fid.

24. Valeriana pulchella Mart. & Gal. in Bull. Acad. Brux. 11^1:123. 1844. T.: *Galeotti 2560!* (BR, D, MO photo).

Valeriana Woodsonii Standl. in Ann. Mo. Bot. Gard. 27:346. 1940. T.: *Woodson, Allen, Seibert 1043!* (F, MO, NY).

Perennials 1.5–5.5 dm. tall, from simple or forked tap-roots which are often fascicular and more or less fusiform, somewhat verrucose in age, 0.7–1.5 cm. thick to 8.5 cm. long; caudex covered with marcescent, brownish-papyraceous leaf bases of previous seasons. *Stem* 1–2 mm. in diameter, glabrous or sparsely pilosulous, the nodes consistently pilosulous. *Leaves* disposed mostly towards the base, more or less imbricate, sometimes forming a rather loose rosette, petiolate, pinnate to pinnatifid, or lanceolate- to obovate-spatulate, 6.5–12.2 cm. long, 1.5–5.5 cm. wide, dentate to repand or essentially entire, glabrous or glabrescent, the terminal lobe abruptly expanded, elliptic to obovate or suborbicular, 1.3–3.4 cm. long, 1.4–2.9 cm. wide, acute to obtuse, the lateral lobes 1–5 pairs, distinct, narrower and shorter than the terminal lobe, grading smaller; petioles 1.5–7.0 cm. long. *Inflorescence* a compound dichasium, terminal dichotomies 1–2 cm. wide in anthesis, later about 4–6 cm. wide, the nodes usually tufted-pilosulous, the internodes glabrous or scattered-pilosulous; bracts 6–9 mm. long, linear-acuminate to spatulate and 2.0–2.5 mm. wide; flowers hermaphroditic, rarely gynodioecious. *Corolla* infundibuliform, that of the perfect flower 4–6 mm. long, of the pistillate 2.5–3.0 mm. long, glabrous without, the lobes half as long as the gibbous tube, the throat scattered-pilosulous within. *Stamens* and style exserted. *Achenes* oblong to broadly ovate, sometimes more or less abaxially keeled, 3.0–3.6 mm. long, 1.2–2.2 mm. wide, smooth, sometimes purplish maculate, glabrous or hirtellous, abaxial ribs rather prominent. *Calyx-limb* 11- to 12-fid or obsolete.

Type Locality: "forets de la Sierra de Yavezia, à 7500 pieds", Oaxaca, Mexico.

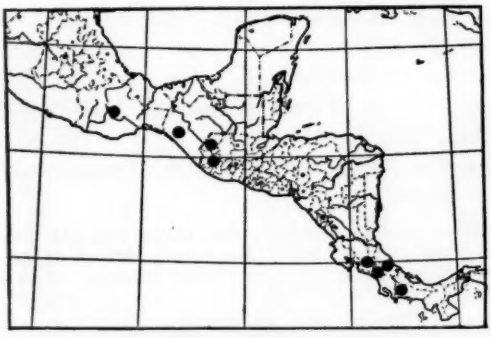

Fig. 37. Distribution of *V. pulchella*.

Distribution: In the mountains, 4600–11500 ft. alt. Oaxaca to Panama. Flowering and fruiting May to October.

Mexico: oaxaca: Sierra de Yavezia, *Galeotti 2560* (BR, D, MO photo). chiapas: without definite locality, *Ghiesbreght 622* (GH, K, MO).

Guatemala: huehuetenango: near Tunima, Sierra de los Cuchumatanes, *Steyermark 48303* (F); Los Encuentros, *Johnston 1009a* (F). quezaltenango: Sololá, Bergwald zur Totonicapán und Los Encuentros, *Seler 2340* (GH, NY, US).

COSTA RICA: SAN JOSÉ: Cerro de la Muerte, *Barbour 1028* (F); near summit of Dos Burros Peaks, Cerro de la Muerte, *Dayton 3071* (F); Cerro de las Vueltas, *Pittier 10448* (US).

PANAMA: CHIRIQUÍ: Volcán de Chiriquí, Potrero Muleto, *Davidson 1023* (F, GH, MO); vicinity of Finca Lerida, *Woodson & Schery 377* (GH, MO); Loma Larga to summit, Volcán de Chiriquí, *Woodson, Allen, Seibert 1043* (F, MO, NY).

Valeriana pulchella may be distinguished by the compound dichasial inflorescence and the oblong to broadly ovate achenes with the setose calyx-limb 11- to 12-fid or sometimes merely dentate. The distribution of this species is confined, essentially, to the mountains of Central America. It appears to be most closely related to *V. deltoidea*.

Series VI. SORBIFOLIAE F. G. Mey., n. ser.

Perennials or annuals from subnapiform tap-roots or rarely rhizomes. *Stem* leafy, voluble or erect, glabrous to pilosulous or retrorse-hirtellous. *Leaves* basal or cauline, ovate-cordate, undivided or pinnate to bipinnatifid, ovate-oblong to suborbicular or oblanceolate- to obovate-spatulate, acute or obtuse, sometimes acuminate or subcaudate, glabrous or scattered-pilosulous. *Inflorescence* an aggregate dichasium, the terminal scorpioid branches 0.6–4.0 cm. long; flowers hermaphroditic or gynodioecious. *Corolla* campanulate-infundibuliform, 0.5–3.0 mm. long. *Stamens* and style included (more or less exserted in *V. robertianifolia*), anthers distinctly 2-lobed, the loculae equal in length. *Achenes* oblong-linear, elliptic to oval, pubescent on the adaxial side, glabrous on the abaxial, or sometimes uniformly pubescent or glabrous. *Calyx-limb* 6- to 11-fid. Species, 5.

TYPE SPECIES: *Valeriana sorbifolia* HBK.

DISTRIBUTION: Southwestern and southeastern United States, Mexico, Central America, and the West Indies. The species within series SORBIFOLIAE are the most widely distributed of those south of the United States. They are most easily distinguished by the stamens, which are usually included, and by the relatively small corolla, 0.7–2.8 mm. long.

KEY TO THE SPECIES*

A. Stem voluble. Achenes typically subfabriliform (bellows-shaped). South Florida; West Indies, Mexico to Panama; also in South America.. 25. *V. scandens*

AA. Stem erect. Achenes obviously not subfabriliform.

B. Rhizomatous perennials. Leaves predominantly undivided or 3-parted, crenate to crenate-dentate, firmly membranaceous. Hispaniola..... 26. *V. domingensis*

BB. Annuals from subnapiform to fusiform tap-roots. Leaves predominantly pinnate to pinnatifid, rarely undivided, thinly membranaceous, lateral lobes 1–6 pairs.

C. Stamens exserted, longer than the corolla lobes. Leaves pinnate to pinnatifid or bipinnatifid, terminal lobe palmately 3-lobed or more or less irregularly 5- to 10-cleft or dentate. Corolla 0.5–1.0 mm. long. Calyx-limb 6- to 7-fid. South-central Mexico to Costa Rica..... 27. *V. robertianifolia*

*The putative hybrid *V.* × *Ekmanii* (*V. domingensis* × *V. s. scandens*) follows the discussion under *V. domingensis*.

CC. Stamens included, shorter than the corolla lobes, nearly sessile. Leaves pinnate to pinnatifid, occasionally undivided, terminal lobe serrate to dentate or repand to entire. Corolla 1.0–2.8 mm. long. Calyx-limb 6- to 11-fid.

D. Leaves undivided, or the lateral lobes of the divided leaves usually more or less decurrent on the winged rhachis. Achenes elliptic- to oval-patelliform, relatively thin, 1–3 (–4) mm. long, 0.9–2.5 mm. wide, the adaxial margins more or less winged, plane or undulate. Calyx-limb 8- to 11-fid. Northwestern Mexico to Costa Rica ..... 28. *V. Palmeri*

DD. Leaves pinnate to pinnatifid, with the lateral lobes usually distinct. Achenes ovate to ovate-oblong, often somewhat ampulliform, more or less turgid, 0.6–2.0 mm. long, 0.4–1.6 mm. wide, the adaxial margins more or less involute. Calyx-limb 6- to 11-fid. Southeastern Arizona; Baja California to Honduras and Panama; also in South America ..... 29. *V. sorbifolia*

25. VALERIANA SCANDENS L. Sp. Pl. ed. 2. 47. 1762. T.: unknown.[31]

Perennials voluble or clambering; subterranean portion not seen. *Stem* leafy, the lowermost becoming more or less suberous in age, much branched above, 1–3 mm. in diameter, the internodes 6–26 cm. long, glabrous or sparsely spreading-pilosulous throughout. *Leaves* cauline, petiolate, undivided or 3-parted, ovate-cordate, short or relatively long-acuminate, acute, sometimes mucronate, 4.5–18.0 cm. long, serrate to crenate, dentate to repand or essentially entire, glabrous or scattered-pilosulous above, glabrous below, the blades of the undivided leaves 3.2–11.0 cm. long, 2.0–8.8 cm. wide, the terminal lobe of the divided leaves ovate to ovate-oblong, 2.2–11.0 cm. long, 0.9–6.3 cm. wide, lateral lobes smaller, often somewhat oblique; petioles 1.3–10.2 cm. long. *Inflorescence* an aggregate dichasium, 12–40 cm. long, glabrous or sometimes rather densely pilosulous; bracts 1.7–2.5 cm. long, glabrous or sometimes densely pilosulous; flowers gynodioecious. *Corolla* more or less campanulate-infundibuliform, of the perfect flowers 1.0–2.3 mm. long, of the pistillate 0.5–1.0 mm. long, white, glabrous without, the lobes less than half the length of the gibbous tube, the throat scattered-pilosulous or glabrous within. *Stamens* and style exserted. *Achenes* oblong-linear to oval, subfabriliform (bellows-shape) with 2 relatively prominent subperipheral and 1 median abaxial vein, 1.9–3.1 mm. long, 1–2 mm. wide, smooth, tawny to brownish, sparsely pilosulous on the adaxial side, glabrous on the abaxial. *Calyx-limb* 11- to 15-fid.

Valeriana scandens is provisionally separated into varieties: *Candolleana* with undivided leaves, and *scandens* with 3-parted leaves. The populations with these leaf forms occupy essentially the same geographical distribution but in spite of this overlap, these leaf types remain comparatively distinct. I have found only three or four intermediate specimens, out of a few hundred examples, in which both leaf forms occurred on the same individual. The populations of *V. scandens* appear to be differentiating more or less independently for leaf shape irrespective of other morphological characters.

[31] Based on Loefling, Iter Hisp. 235. 1758. Collected at Cumaná, Venezuela, in January 1755, Loefling's type does not exist in the Linnean Herbarium in London.

KEY TO THE VARIETIES

A. Leaves 3-parted ..... 25a. *V. s. scandens*
AA. Leaves undivided ..... 25b. *V. s. Candolleana*

25a. VALERIANA SCANDENS L. var. SCANDENS.

Valeriana volubilis Sessé & Mociño ex DC. Prodr. 4:634. 1830, *nomen nudum.*
Valeriana phaseoli Braun in Ind. Sem. Hort. Berol. 13 (App. 2). 1851. T.: *Chrismar s. n.*
Valeriana scandens α *genuina* Muell. in Mart. Fl. Bras. 6^4:344. 1855.
Valeriana scandens β *angustiloba* Muell. *l. c.* 1885. T.: *Mueller 769!* (NY, W).
Valeriana scandens δ *dentata* Muell. *l. c.* 1885, *p. p.*

Perennials voluble or clambering. *Stem* leafy, much branched above. *Leaves* 3-parted, the terminal lobe ovate to ovate-oblong, 2.2–11.0 cm. long, 0.9–6.3 cm. wide, lateral lobes smaller, often somewhat oblique; petioles 1.3–10.2 cm. long.

TYPE LOCALITY: "Habitat in Cumana" [Venezuela]. Collected January, 1755.

DISTRIBUTION: Open rocky or densely wooded slopes in mixed forest by edge of streams or on river flats, from near sea-level to 10000 ft. alt. Florida, West Indies, Mexico, rare in Central America; also in South America. Flowering and fruiting throughout the year.

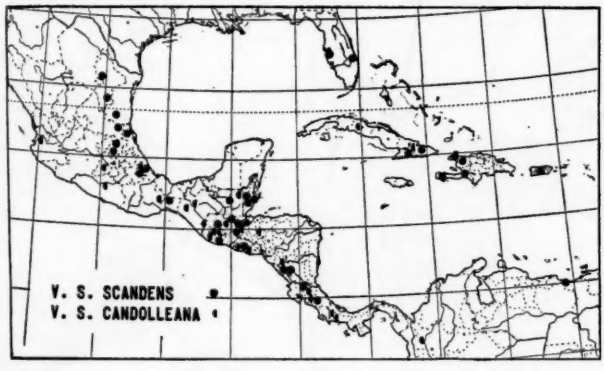

Fig. 39. Distribution of *V. scandens* var. *scandens* and *V. scandens* var. *Candolleana.*

UNITED STATES:
FLORIDA: Indian River, *Palmer 222* (MO); Manatee, *Simpson s. n.* (MO); Turtle Mound, *Small 11563* (S); Pineola, *Small, Small, DeWinkeler 10080* (D, MO, S); Titusville, *Small, Small, DeWinkeler 10806* (S).

MEXICO: HIDALGO: *ca.* 43 mi. ne. Jacala, *Hitchcock & Stanford 6968* (GH); Chapulhuacán, *Kenoyer A620* (F); near Puerto Obscuro, *Sharp 441307* (MO). NUEVO LEON: Monterrey, *Kenoyer s. n.* (MO). OAXACA: Yaveo, near Río Yaveo, *Mexia 9213* (D, F, GH, MO, NY, S, UC); vicinity of Cafetal Concordia, *Morton & Makrinius 2549* (F, US). PUEBLA: regio Huauchinango, Necaxae Mont Tepaxinola, *Fröderström & Hultén 686* (S). SAN LUIS POTOSI: Las Canoas, *Pringle 4063* (US); prope Tancanhuitz, *Seler 704* (GH). TAMAULIPAS: 10 km. ne. El Progresso and 18 mi. nw. Ocampo, *Stanford, Retherford, Northcraft 1008* (GH, MO, NY). VERA CRUZ: Orizaba, *Botteri 322* (F, US); Wartenberg, near Tantoyuca, Huasteca, *Ervendberg 357* (GH); Totozmalpa, *Galeotti 7045* (BR,

Fig. 38. *Valeriana scandens* var. *scandens*: Habit, × 1/3; pistillate flower (lower left) and staminate (lower right), × 6.

D); Cordoba, *Greenman 133* (F, GH, NY); Colipa, *Liebmann 10839, 10840;* Cazadero, *Liebmann 10841;* Mirador, *Liebmann 10844* (US);Hacienda Mirador, *Nelson 111* (US).

BRITISH HONDURAS: El Cayo Dist., El Cayo, *Bartlett 11466* (MU); El Cayo Dist., San Antonio, *Bartlett 13033* (MU); Sittee River, *Peck 956* (GH); "22 mile Stann Creek River," *Schipp 947* (D, F, GH, MO, MU, NY, S, UC).

GUATEMALA: ALTA VERAPAZ: Finca Trece Aguas, *Goll 90* (US); Patin, below Tamahú, *Standley 70855* (F); along Río Polochic below Tamahú, *Standley 91781* (F); sw. of Lanquin, *Steyermark 44112* (F, GH); Cubilquitz, *Tuerckheim 7915* (GH, NY, US). CHIQUIMULA: Cerro Tixixi, n. Jocotán, *Steyermark 31607* (F). ESCUINTLA: between Río Jute and Río Pantaleon, *Standley 63371* (F). IZABAL: between Los Amates and Izabal, *Kellerman 7357* (F, NY); Quebradas, *Blake 7558* (US). PETÉN: La Libertad, *Aguilar 471* (F); San Clemente to Dos Arroyos, *Bartlett 12828* (MU).

EL SALVADOR: SAN SALVADOR: San Martin to Laguna de Ilopango, *Standley 22624* (GH, NY, US).

NICARAGUA: Volcán Mombacho, *Baker 151* (GH, MO, NY, UC, WYO); vicinity of Casa Colorada near El Crucero, Sierra de Managua, *Standley 8362* (F).

COSTA RICA: ALAJUELA: Villa Quesada, *Smith P2545* (MO).

CUBA: ORIENTE: Loma del Gato, Sierra Maestra, *Clement 601* (NY); Sierra Maestra, above Daiquiri, *Ekman 8082* (D, NY, S); Loma del Gato, Cobre range of Sierra Maestra, *Leon, Clement, Roca 9916* (NY); La Perla, *Shafer 8487* (GH, NY); prope villam Monte Verde, *Wright 278* (CGE, GH). SANTA CLARA: mts. of Trinidad (Siguanea group), valley of Río Hanabanilla, *Ekman 18505* (S).

HISPANIOLA: HAITI: Dept. du Sud, Marne de la Hatte ad Ma, *Ekman 621* (S); Dept. du Sud, prope Constant, *Ekman 790* (S); Massif de la Hatte, Miragoane, near Quatre-Chemins, *Ekman 9209* (S, US); Guimbi Galata, Marnes des Commissaires, *Holdridge 1365* (US); vicinity of Mission, Fonds Varettes, *Leonard 3686* (GH, NY, US); vicinity of Furcy, *Leonard 4408* (US), *4622* (GH, NY, US); vicinity of St. Michel de l'Atalaye, Dept. du Nord, *Leonard 7824* (F,US); vicinity of Kalacroix, Dept. de l'Artibonite, *Leonard 7915* (GH, US); vicinity of Marmelade, Dept. du Nord, *Leonard 8094* (NY, UC, US); vicinity of Ennery, Dept. de l'Artibonite, *Leonard 8992* (MO, US); vicinity of Port de Paix, *Leonard 12240* (US); vicinity of Bombardopolis, *Leonard 13566* (US); vicinity of Port au Prince, Petionville, *Leonard 15800* (US); Plaisance, *Nash & Taylor 1783* (NY). DOMINICAN REPUBLIC: Prov. Barahona, *Abbott 1800* (US); Montiada Nueva, se. Polo, *Howard 8526* (GH); en el Corozo, à orillas del Río Amina, Prov. de Santiago, *Jimenez 1122* (US).

PUERTO RICO: Mt. Morales, near Utuado, *Britton & Cowell 495* (F, NY, US); alto de la Bandera, near Adjuntas, *Britton & Shafer 2116* (NY); Monte Cerrote, near Adjuntas, *Britton & Brown 5401* (NY, US); along the Guayama, Cayey road, *Britton, Britton, Earle 6453* (NY); Maricao in sylvis montis Montos, *Sintenis 302* (D, MO, S, US); adjuntas in sylva montis Capaes, *Sintenis 4027* (F); adjuntas in monte Galsa, *Sintenis 4232* (MO, NY, UC, US).

The 3-parted leaves readily distinguish *V. s. scandens,* except in rare instances when the 3-parted and undivided leaf forms occur in the same individual, viz. *Britton & Brown 5889* from Puerto Rico, and *Wright 276-277* from Cuba. This variety is found abundantly in Florida and Mexico. In South America it is widely distributed over the northern half of the continent.

In Hispaniola *V. s. scandens* hybridizes with the endemic *V. domingensis,* but this is discussed more fully under the latter species.

25b. VALERIANA SCANDENS L. var. CANDOLLEANA (Gard.) Muell. Fl. Bras. 6^4:344. 1885.

Valeriana alpina Vell. Fl. Flum. 28. 1825; 1:*t. 68.* 1827.
Valeriana Candolleana Gardn. in Hook. Lond. Jour. Bot. 4:112. 1845. T.: *Gardner 461!* (BM, K, MO photo, W).

Valeriana Mikaniae Lindl. in Jour. Hort. Soc. 3:316. 1848. T.: *Skinner s.n.!* (CGE, MO photo).
Valeriana scandens L. var. δ *dentata* Muell. *l. c.* 1885, *p. p.*

Perennials, voluble or clambering. *Stem* leafy, much branched. *Leaves* undivided, ovate-cordate, short or relatively long-acuminate, acute, sometimes mucronate, 4.5–18.0 cm. long, serrate to crenate, dentate to repand or essentially entire, glabrous or scattered-pilosulous above, glabrous below, the blades 3.2–11.0 cm. long, 2.0–8.8 cm. wide.

TYPE LOCALITY: BRAZIL: in bushy places near the summit of the Organ Mountains. Flowering April and May.

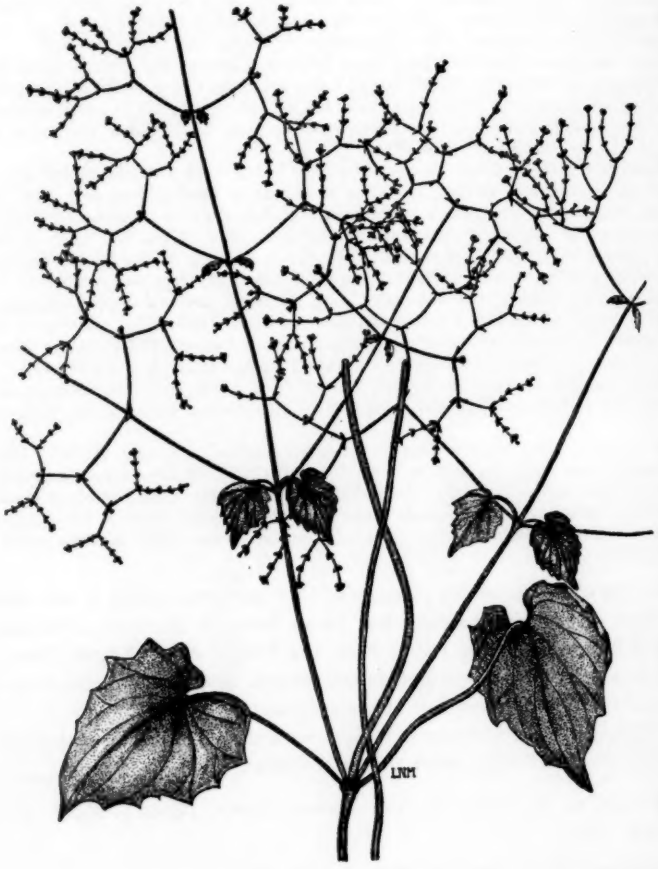

Fig. 40. *Valeriana scandens* var. *Candolleana:* Habit, × ⅛.

DISTRIBUTION: Cuba, Hispaniola, Puerto Rico; also Mexico and Central America. Open rocky or densely wooded slopes in mixed forest by edge of streams or on river flats, from near sea-level to 10000 ft. alt. Flowering and fruiting throughout the year.

MEXICO: CHIAPAS: Siltepec, *Matuda 562* (F); Mt. Pasitar, *Matuda 1071* (GH, MO, MU); Fraylesca, Siltepec, *Matuda 5209* (F). GUERRERO: Dist. Galeana, Carrizo, Sto. Domingo, *Hinton 14719* (GH, NY). JALISCO: west of San Sebastián, Hacienda del Ototel, *Mexia 1845* (D, F, GH, MO, NY, UC, US). MEXICO: Dist. Temascaltepec, La Labor, *Hinton 3240* (D, GH, MO, NY); Dist. Temascaltepec, Cumbre-Pena Blanca, *Hinton 8955* (GH). OAXACA: Chinantla, Villa Alta, *Galeotti 2561* (NY, US). VERA CRUZ: Orizaba, *Botteri 568* (CGE, D); Acultizingo, *Matuda 1177* (MU); Lobani, *Liebmann 10826;* Amatlan, *Liebmann 10827;* Huatusco, *Liebmann 10847* (US); Zacualpan, Barranca de Tanampa, *Purpus 2870* (UC).

GUATEMALA: ALTA VERAPAZ: Cobán, *Muenscher 12554* (F); near San José, se. Tactic, *Standley 69646* (F). CHIMALTENANGO: Volcán Acatenango, *Hunnewell 14868* (GH); Santa Elena, *Skutch 155* (US); above Las Calderas, *Standley 60083* (F). EL PROGRESO: hills between Finca Piamonte and slopes se. Finca Piamonte, *Steyermark 43397* (F). GUATEMALA: Finca La Aurora, *Aguilar 250* (F); Volcán de Pacaya, above Las Calderas, *Standley 58397* (F). JALAPA: vicinity of Soledad, between Jalapa and Mataquescuintla, *Steyermark 32639* (F). QUEZALTENANGO: Finca Helvetia, *Skutch 1408* (F, GH, NY); above Santa Maria de Jesús, *Standley 67273* (F); damp thickets near Columbia, *Standley 67956* (F); Finca Pirineos, below Santa Mariá de Jesús, *Standley 68256* (F); se. Palestina, *Standley 84209* (F); between Finca Pirineos and Patzulin, *Standley 86588* (F); between Columba and Las Mercedes, *Standley 87963* (F); Finca Pirineos, Volcán Santa Mariá, *Steyermark 33235* (F); Volcán Zunil, *Steyermark 34742* (F). QUICHE: San Miguel Uspantan, *Heyde & Lux 2924* (GH, MO, NY, US). SACATEPÉQUEZ: Cuesta de las Canas, above Antigua, *Standley 58961* (F); barranco above Dueñas, *Standley 63291* (F). SAN MARCOS: Volcán Tajumulco, 7 mi. from San Sebastián, *Steyermark 35866* (F); barrancos bordering Rio Vega near Volcán Tacaná, *Steyermark 36339* (F). SANTA ROSA: Volcán Tecuamburro, *Heyde & Lux 4486* (F, GH, NY, US). SOLOLÁ: Volcán Santa Clara, *Steyermark 46891* (F). SUCHITEPEQUEZ: near Pueblo Nuevo, *Standley 66948* (F). ZACAPA: between Cerro de Monos and upper slopes of Monte Virgen, *Steyermark 42855* (F).

EL SALVADOR: AHUACHAPAN: near Ataco, *Standley & Padilla V. 2660* (F); Cerro de San Jacinto, *Standley 20616* (GH, NY, US). SAN VICENTE: Volcán de San Vicente, *Standley 21526* (GH, US).

HONDURAS: COMAYAGUA: Río Selan, *Valerio 2842* (F); vicinity of Siguatepeque, *Standley 56305* (F, US). EL PARAISO: Güinope, *Valerio 1742* (F).

NICARAGUA: vicinity of Casa Colorada, near El Crucero, summit of Sierra de Managua, *Standley 8205* (F); Sierra de Managua, *Garnier 1074* (US); summit of Mt. Mombacho, near Granada, *Grant 834* (F, GH).

COSTA RICA: near San Ramón, *Brenes 4766* (F); La Palma de San Ramón, *Brenes 5780* (F); San Pedro de San Ramón, *Brenes 22884* (F); south of Cartago, *Chrysler 5382* (F); buissons à chemin de Mano de Tigre, *Tonduz 4598* (US); Copey, *Tonduz 11728* (US); Concavas, *Lankester 265* (F); Laguna del Reventado, *Pittier 14107* (US); Prov. San José, vicinity of El General, *Skutch 2177* (MO, NY, US); Vara Blanca de Sarapiqui, between Poas and Barba volcanoes, *Skutch 3541* (MO, NY); region of Zarcero, *Smith A569* (F, MO), *A604* (F); Prov. Alajuela, Villa Quesada, *Smith P2099* (GH); Prov. San José, vicinity of La Verbena, *Standley 32227* (US); Prov. San José, Cerro de Piedra Blanca, above Escazu, *Standley 32633* (US); Río Birris, s. slopes of Volcán de Irazu, *Standley 35397* (US); Prov. Cartago, La Estrella, *Standley 39270* (US).

PANAMA: CANAL ZONE: near river on island, *White 153* (MO). CHIRIQUÍ: vicinity of "New Switzerland", central Valley of Río Chiriquí Viejo, *Allen 1419* (GH, MO, NY); Baja Chorro, Boquete, *Davidson 443* (F, GH, MO); Volcán de Chiriquí, Boquete Dist., *Davidson 886* (F, GH); Los Siguas, *Pittier 3188* (F); Río Ladrillo, above El Boquete,

Pittier 3288 (US); Dist. Boquete, Salla-Camiseta, *Terry 1367* (F, GH, MO); vicinity of Finca Lerida, *Woodson & Schery 225* (GH, MO); vicinity of Callejon Seco, Volcán de Chiriquí, *Woodson & Schery 488* (GH, MO); Bajo Mona, mouth of Quebrada Chiquero, along Río Caldera, *Woodson, Allen, Seibert 999* (MO, NY). DARIÉN: Cana, *Williams 726* (NY).

CUBA: PINAR DEL RIO: Sierra de las Animas, *Ekman 10513* (S); Pan de Quajaibon, *Ekman 12756* (S); Sabien hill, *Leon 12926* (NY). SANTA CLARA: Trinidad Mts., Manantiales, *Britton & Wilson 5261* (NY).

HISPANIOLA: DOMINICAN REPUBLIC: Cordillera Central, Prov. de Azua, San Juan, Lomas de la Mediania, Sagana Nueva, *Ekman 13580* (US). PUERTO RICO: between Aibonito and Coamo, *Britton, Britton & Brown 5889* (NY).

The var. *Candolleana* is readily distinguished from var. *scandens* by the undivided ovate-cordate leaves in contrast to the 3-parted leaves of the latter. Interbreeding between these taxa does not appear to be common, and, although their distributions overlap in over 95 per cent of the specimens examined, this single character difference is completely diagnostic. Of the two varieties, the var. *Candolleana* is the more common in Central America, and in South America it is widespread over much the same geographical area as *V. s. scandens*.

An interesting element of var. *Candolleana* in Guatemala may be recognized as follows:

Inflorescence frequently densely pilosulous. *Achenes* 2.0–2.2 mm. long, 0.9–1.0 mm. wide. Representative specimens: *Aguilar 927; Heyde & Lux 4486; Matuda 1071; Standley 60083; Tuerckheim 1247.*

26. VALERIANA DOMINGENSIS Urban. Symb. Ant. 1:450. 1899. T.: *Eggers 2229b.*

Perennials 4–9 dm. tall, erect, from relatively short rhizomes 1–3 mm. thick. *Stem* moderately leafy or subscapose, 1–3 mm. in diameter, glabrous or sometimes minutely puberulent on the nodes. *Leaves* predominantly basal, often rather closely imbricate, forming a loosely tufted rosette, petiolate, undivided or 3-parted, obovate-spatulate, 5–20 cm. long, crenate to crenate-dentate, light green to somewhat glaucous below, green above, firmly membranaceous, glabrous, the terminal lobe of the divided leaves abruptly expanded, ovate to suborbicular, sometimes cordate, subacute to obtuse, 1.0–3.5 mm. long, 0.9–3.2 cm. wide, the lateral lobes distinct, much reduced, 0.4–1.4 cm. long, 0.2–1.0 cm. wide; petioles 2.6–17.0 cm. long, glabrous; cauline leaves 2–5 pairs, shorter than the basal, the lower petiolate, the uppermost reduced and sessile. *Inflorescence* an aggregate dichasium, 10–38 cm. long, 5–10 cm. wide, the terminal scorpioid branches 0.8–3.0 cm. long, glabrous; bracts 1.5–2.0 mm. long, glabrous; flowers hermaphroditic(?). *Corolla* campanulate-infundibuliform, 1.5–2.0 mm. long, white, the lobes less than half the length of the often obscurely gibbous tube, the throat glabrous or scattered-pilosulous within. *Stamens* and style included. *Achenes* oblong-linear to ovate, 1.5–3.0 mm. long, 0.9–1.2 mm. wide, smooth, sometimes tawny-maculate, glabrous or occasionally sparsely pilosulous on the adaxial side, abaxial ribs prominent, subcarinate. *Calyx-limb* 10-fid.

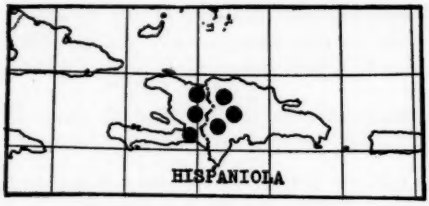

Fig. 41. Distribution of *V. domingensis*.

TYPE LOCALITY: "Sto. Domingo in aqua rivuli Valle Nuevo, alt. 2270 m., gregaria crescens, m. Majo flor."

DISTRIBUTION: Moist thickets, open pine forests, and limestone outcrops, 4290–8900 ft. alt. Hispaniola. Flowering and fruiting June to October.

HAITI: Massif de la Selle, Marne Tranchant, *Ekman 1182* (S, US); Massif de la Selle, Marne la Visite, *Ekman 1403* (S); Guimbi Balata, Marnes des Commissaires, *Holdridge 1277* (US); vicinity of Furcy, *Leonard 4490a* (NY, US).

DOMINICAN REPUBLIC: Prov. de La Vega, Valle Nuevo, toward Sabana Alta, *Ekman 13791* (S, US); prope Cerro Saroza, *Tuerckheim* (D, GH, NY, US).

Valeriana domingensis may be distinguished by its erect habit and undivided or 3-parted, firmly membranaceous, crenate to crenate-dentate leaves. This species is endemic to Hispaniola.

26a. VALERIANA × **Ekmanii** *(Valeriana domingensis* × *s. scandens)* F. G. Mey., hyb. nov.

Planta subvolubilis altitudine ignoto. Folia simplicia aut 3-partita repando-dentata aut crenato-dentata integra. Achaeniae oblongae vel subfabriliformes, glabrae vel pilosulae.

TYPE LOCALITY: Hispaniola, Santo Domingo: Prov. de Azua, Loma Nalga de Meco, 1600–1800 m., June 9, 1926.

DISTRIBUTION: Known only from the Dominican Republic.

DOMINICAN REPUBLIC: without definite locality, *Canela 357, 363* (P); Prov. Azua, *Ekman 6290* (S HOLOTYPE, US); Sierra de Ocoa, Prov. de Azua, San Jose de Ocoa, Loma del Rancho, *Ekman 11643* (S, US); without definite locality, *Ekman 13580* (S).

Valeriana × *Ekmanii* is the clearest example of natural hybridization that I have seen in the North American species. This hybrid was first recognized in a suite of specimens collected by Ekman in the Dominican Republic amongst a loan from the Stockholm Museum. These specimens did not present the usual subtleties of many natural hybrids, but, rather, characters almost exactly intermediate for the putative parents. The intermediates manifest the effect of diluting in a proportion of approximately 1:1 the voluble habit of *V. scandens* and the leaf shape of *V. domingensis*, and since these are the only species in Hispaniola there is no doubt as to the

parentage. I have seen additional material of this hybrid at the Paris Museum collected by Dr. Canela. At least phenotypically, the populations of *V.* × *Ekmanii* appear to be those of an F_1 hybrid rather than due to the subtleties of introgression.

27. VALERIANA ROBERTIANIFOLIA Briq. in Ann. Conserv. & Jard. Bot. Genève 17:342. 1914. T.: *Sallé 70!* (D, MO photo).

Valeriana venezuelana Briq. *l. c.* 338. 1914. T.: *Linden 463!* (BM, E, FI, G, K, OXF, P). *Valeriana delicata* Standl. & Steyerm. in Field Mus. Publ. Bot. 23:255. 1947. T.: *Steyermark 50936!* (F).

Annuals 1.4–6.4 dm. tall, erect, from subnapiform tap-roots 1–4 mm. thick. *Stem* moderately leafy, 0.5–2.0 mm. in diameter, uniformly retrorse- or spreading-hirtellous. *Leaves* cauline, 5–8 pairs, petiolate, pinnate to pinnatifid or bipinnatifid the lowermost rarely undivided, cordate, ovate to ovate-oblong or obovate-spatulate, obtuse, 1.4–6.5 cm. long, 0.8–4.0 cm. wide, uniformly hirtellous above, more or less restricted to the veins below, the terminal lobe 1.5–3.0 cm. long, 1.1–1.4 cm. wide, palmately 3-lobed, these 1- to several-cleft or the lobes more or less irregularly 5- to 10-cleft or dentate, the lobes 2(–3) pairs, distinct, oblong to obovate, 3- to 5-cleft or more or less irregularly dentate; petioles 0.5–2.7 cm. long, uniformly retrorse- to spreading-hirtellous. *Inflorescence* an aggregate dichasium, 9–38 cm. long, 4–12 cm. wide, the terminal scorpioid branches 0.6–1.1 cm. long, glabrous; bracts 1.0–1.5 mm. long, glabrous; flowers gynodioecious. *Corolla* campanulate-infundibuliform, that of the perfect flower 0.5–1.0 mm. long, of the pistillate about 0.5 mm. long, glabrous without, pinkish, the lobes less than half the length of the gibbous or straight tube, the throat glabrous within. *Stamens* and style more or less exserted. *Achenes* ovate to elliptic, 1.0–1.1 mm. long, 0.8–0.9 mm. wide, smooth, more or less rubiginose, often reddish brown-maculate, glabrous on the abaxial, densely hirtellous on the adaxial side, abaxial ribs indistinct. *Calyx-limb* 6- to 7-fid.

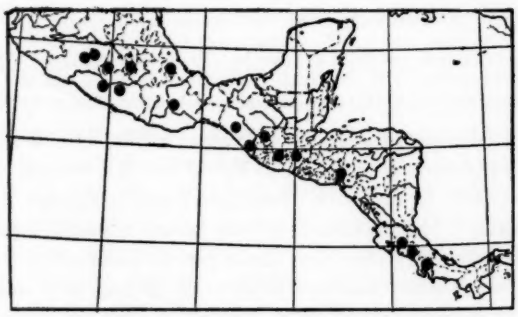

Fig. 42. Distribution of V. *robertianifolia*.

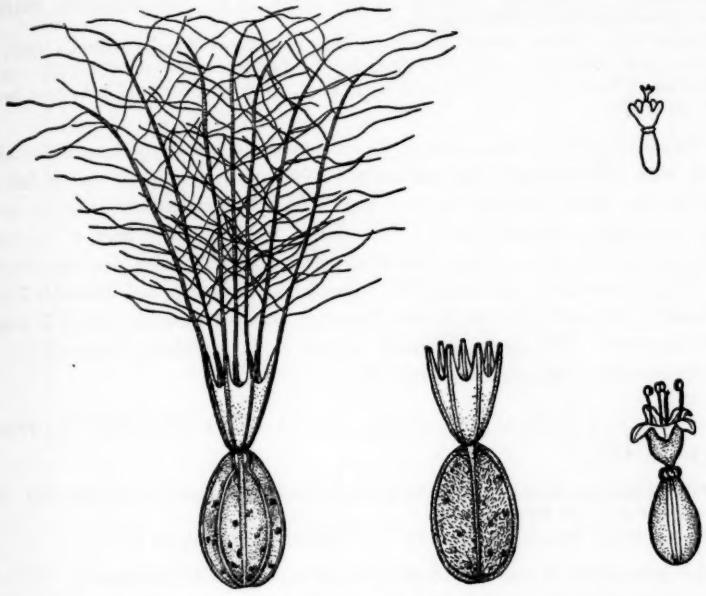

Fig. 43. *Valeriana robertianifolia*: Achenes, × 20; pistillate flower (above) and staminate (below), × 10.

TYPE LOCALITY: "env. d'Orizaba. 1854–55."

DISTRIBUTION: Oak-pine forests, moist rocky slopes, along roadways, 4900–8500 ft. alt. South-central Mexico to Costa Rica. Flowering and fruiting August to December.

MEXICO: CHIAPAS: Mt. Ovando, *Matuda 2193* (MU); Mt. Tacana, *Matuda 2492* (MAT, MU); Cerro del Boquerón, *Purpus 6703* (GH, MO, US). GUERRERO: Dist. Mina, Mancon, *Hinton 9604* (GH); Dist. Mina, Laguna-Paracho, *Hinton 9938* (GH); Dist. Mina, Pilas, *Hinton 10702* (GH); Dist. Galeana, Carrizo-Sto. Domingo, *Hinton 14733* (F, GH, MO, NY); near Omilteni, *Sharp 441549* (MO). JALISCO: without definite locality, *Jony s. n.* (US). MEXICO: Dist. Temascaltepec, Comunidad, *Hinton 1568* (GH, K, UC). MICHOACÁN: vicinity of Morelia, Cerro Azul, *Arsène 2458* (GH, MO, NY, US); vicinity of Morelia, *Arsène 3225* (US); vicinity of Morelia, Cerro San Miguel, *Arsène 6071* (MO, US); vicinity of Morelia, Loma Santa Maria, *Arsène 9024* (US); Dist. Tancítaro, Cerro Tancítaro, *Leavenworth 725* (F, MO); Pátzcuaro, *Pringle 3341* (D, F, GH, MO, NY, S, UC, US, WYO). MORELOS: barranca near Cuernavaca, *Pringle 5996* (MO). OAXACA: Sierras à 8000 pieds, *Galeotti 2076* (P). VERA CRUZ: Orizaba, *Botteri 1192* (D, US); Vallèe de Orizaba Escamella, *Bourgeau 2947* (GH, P, S, US); St. Miquel, *Liebmann 10855, 10856, 10857* (US); Engenio, Sierra de la Cruces, *Müller 1164* (NY).

GUATEMALA: CHIMALTENANGO: Alameda, *Johnston 953* (F); Tecpán, *Skutch 589* (MU, US); road from Chimaltenango to San Martin Jilotepeque, *Standley 57891* (GH, NY). HUEHUETENANGO: Cumbre Papal, between Culico and Ixmoqui, *Steyermark 50936* (F). JALAPA: Laguna de Ayarza, *Heyde & Lux 3970* (F).

HONDURAS: MORAZÁN: Cerro de Uyuca, region of El Valle Encantado, *Standley, Allen, Shank, Padilla* V. *896* (F).

COSTA RICA: Piedra Blanca, *Brenes A4* (F); Potreros of Rancho Redondo, *Dodge & Thomas 5312* (GH, MO, MU, US); Hacienda La Esperanza, *Jimenez 956* (US); region of Zarcero, Palmira, *Smith A296, A538* (F); Prov. Alajuela, Palmira, Alfaro Ruiz, *Smith NY1242* (NY).

The distinguishing characters of *V. robertianifolia* are the pinnate-bipinnatifid leaves with the terminal lobe palmately 3-lobed or sometimes 5- to 10-cleft or dentate, the minute flowers, 0.5–1.0 mm. long, the exserted stamens, the small ovate to elliptic achenes, 1.0–1.1 mm. long, and the calyx-limb 6- to 7-fid. *Valeriana robertianifolia* occurs also in northern South America, but the material that I have seen from Venezuela (*V. venezuelana* Briquet) and Colombia is not sufficiently distinct from the North American populations to be placed in a separate category. This species is closely related to *V. sorbifolia*, from which it is sometimes rather difficult to distinguish.

28. VALERIANA PALMERI Gray in Proc. Am. Acad. 22:417. 1887. T.: *Palmer 754!* (GH).

Valeriana Langlassei Briq. in Ann. Conserv. & Jard. Bot. Genève 17:341. 1914. T.: *Langlassé 408!* (D, GH, K, US).
Valeriana fistulosa Briq. *l. c.* 343. 1914. T.: *Galeotti 2565!* (BR, D, P).

Annuals 2.6–20.0 dm. tall, slender to robust, from subnapiform tap-roots 1–8 mm. thick. *Stem* leafy, 0.1–1.5 cm. thick, terete or sometimes quadrangular towards the base, spreading-pilosulous to pilose, mostly towards the base, glabrescent above. *Leaves* cauline, 6–7 pairs, petiolate, pinnate to pinnatifid or sometimes undivided, elliptic- or oblanceolate- to obovate-spatulate, acuminate, 3.5–33.0 cm. long, 0.9–20.0 cm. wide, serrate to irregularly dentate or essentially entire, spreading-ciliate, sparsely pilosulous above, the veins below pilosulous or glabrous, the terminal lobe of the divided leaves ovate to elliptic, acuminate to subcaudate, acute, 5.4–14.5 cm. long, 2.3–8.0 cm. wide, more or less decurrent on the rhachis, the lateral lobes 1–5 pairs, linear-oblong, relatively much narrower than the terminal lobe, 1.7–6.0(–9) cm. long, 0.3–2.0(–3.5) cm. wide, grading smaller, somewhat decurrent, the rhachis more or less winged; petioles 1–9 cm. long, spreading-ciliate or uniformly pilosulous, extending to the rhachis. *Inflorescence* an aggregate dichasium, 11–40 cm. long, 5–23 cm. wide, the terminal scorpioid branches 0.3–3.5 cm. long, glabrous; bracts 1–2 mm. long, glabrous; flowers hermaphroditic, rarely gynodioecious. *Corolla* infundibuliform to subcampanulate, 1.1–1.9 mm. long, glabrous without, white, the lobes less than half the length of the gibbous tube, the throat sparsely pilosulous within. *Stamens* and style included. *Achenes* elliptic- to oval-patelliform, thin, 1–3(–4) mm. long, 0.9–2.5 mm. wide, smooth or sometimes rugulose, often reddish brown-maculate, spreading-pilosulous on the adaxial side, glabrous on the abaxial, rarely glabrous or pilosulous on both sides, adaxial margins more or less winged, plane or undulate. *Calyx-limb* 8- to 11-fid.

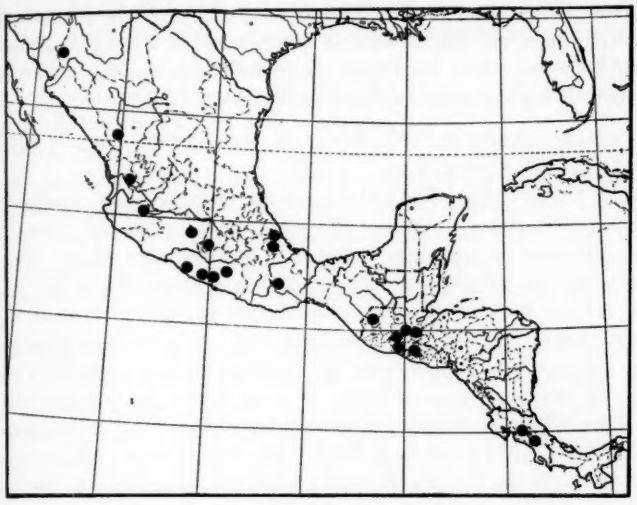

Fig. 44. Distribution of *V. Palmeri.*

TYPE LOCALITY: "Río Blanco, on the river bank, near Guadalajara", Jalisco, Mexico. Sept. 1886.

DISTRIBUTION: Cut-over and pastured slopes, on limestone outcrops, oak-pine canyons, crevices of rocks near water, fields, 2500–7000 ft. alt. Sierra Madre Occidental, Chihuahua to Costa Rica. Flowering and fruiting June to December.

MEXICO: CHIHUAHUA: Sierra Canelo, Río Mayo, *Gentry 2491* (F, GH, GENT, MO, S, UC). DURANGO: without definite locality, *Garcia 933* (US). GUERRERO: Dist. Mina, Zihuaqueo, *Hinton 9308* (GH); Dist. Galeana, Atoyac, *Hinton 10946* (GH); ne. Chilpancingo on road to Chilapa, *Moore & Wood 4628* (MO); 3 kms. past Acahuizotla to Acapulco, *Moore & Wood 4678* (MO). JALISCO: Río Blanco, *Palmer 754* (GH); near Guadalajara, *Pringle 4521* (D, F, GH, MO, NY, UC, US, WYO). MEXICO: Dist. Temascaltepec, *Hinton 1115* (GH, MO); Dist. Temascaltepec, Chorrera, *Hinton 2630* (NY). MICHOACÁN: vicinity of Morelia, Rincón, *Arsène 2538* (GH, MO, NY, S, US); vicinity of Morelia, près Cerro de las Nalgas, *Arsène 2567* (GH, NY, US); vicinity of Morelia, Cerro San Miguel, *Arsène 5262* (MO, US); vicinity of Morelia, Punguato, *Arsène 5745* (GH, MO, NY, US). NAYARIT: La Atarjea, n. Yxtlan, *Mexia 876* (F). OAXACA: Interpeje, *Galeotti 2565* (BR, D, P). VERA CRUZ: Orizaba, *Müller s. n.* (NY); Zacuapan, *Purpus 7864* (UC).

GUATEMALA: CHIQUIMULA: Montaña Nube, between Socorro Mt. and Cerro Brujo, *Steyermark 30905* (F). GUATEMALA: without definite locality, *Aguilar 122* (F). HUEHUETENANGO: along Río Trapichillo, *Steyermark 51023* (F). JALAPA: between Jalapa and San Pedro Pinula, *Standley 77103* (F); Montaña Durazno, *Steyermark 32968* (F). SANTA ROSA: Santa Rosa, *Heyde & Lux 2924, 2924b* (GH, US); Estanzuela, *Heyde & Lux 3968* (NY, US); se. Barberena, *Standley 77863* (F).

EL SALVADOR: on the Guatemalan frontier near Chalehuapa, *Calderón 1061, 1062, 1062a* (US).

COSTA RICA: Cerros de San Antonio de San Ramón, *Brenes 5616* (F); San Pedro de San Ramón, *Brenes 16276* (F); Carrillos de Poas, *Brenes 19300* (F); La Palma de San Ramón, *Quiros 273* (F); Hacienda La Argentina, Grecia, *Valerio 591* (F, US).

Valeriana Palmeri may be distinguished most readily by the achenes which are more or less winged and elliptic- to oval-patelliform. It is most closely related to *V. s. sorbifolia* but differs from that species by the pinnatifid leaves which are usually more or less decurrent on the winged rhachis.

29. VALERIANA SORBIFOLIA HBK. Nov. Gen. et Sp. 3:332. 1819. T.: *Humboldt & Bonpland* (MO photo, P).

Annuals 1.3–12.0 dm. tall, slender to robust, erect or rarely clambering, from subnapiform or fusiform tap-roots 0.3–1.3 cm. thick. *Stem* leafy, 1–10 mm. in diameter, pilosulous or sometimes short-pilose or glabrescent mostly towards the base, the upper portion glabrous. *Leaves* cauline or basal, the cauline 4–7 pairs, petiolate, pinnate, rarely undivided, ovate, elliptic- to obovate-spatulate, obtuse to acuminate, (1.0–)2.7–15.0(–19.5) cm. long, (0.5–)1.2–10.0 cm. wide, serrate to subcrenate, dentate to repand or essentially entire, glabrous or occasionally scattered-pilosulous on both surfaces or only on the veins below, the terminal lobe of the divided leaves elliptic to obovate or suborbicular, obtuse to acute, sometimes more or less acuminate, 1.5–8.2 cm. long, 0.8–7.2 cm. wide, abruptly expanded or sometimes decurrent on the rhachis, the lateral lobes 1–6 pairs, distinct, simulating the terminal lobe, grading smaller; petioles 2.0–6.3 cm. long towards the base, obsolete above, glabrous or pilosulous; basal leaves undivided, 9–12 cm. long, suborbicular,

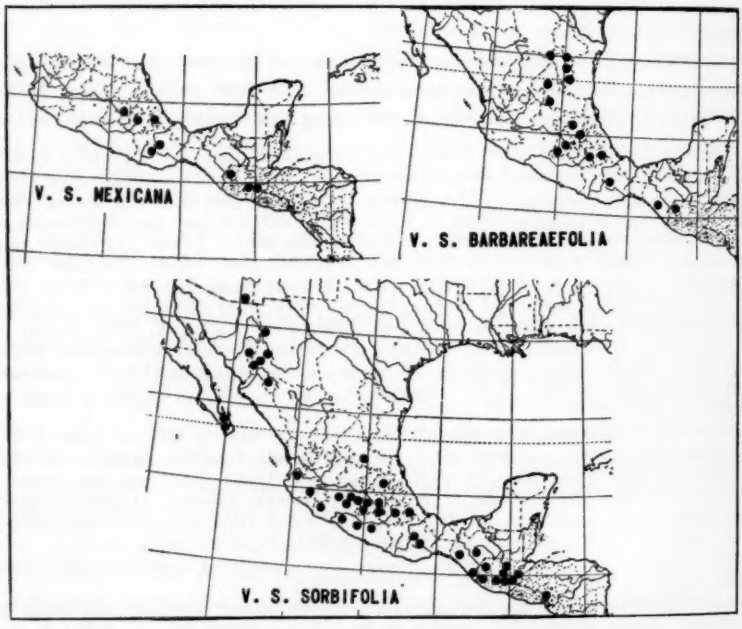

Fig. 45. Distribution of the varieties of *V. sorbifolia*.

repand-dentate, petioles 7.5–10.0 cm. long. *Inflorescence* an aggregate dichasium, 8–55 cm. long, 4–10 cm. wide, the terminal scorpioid branches 0.2–4.0 cm. long, glabrous or sometimes tufted-pilosulous on the nodes; bracts 1.3–2.0 mm. long, glabrous; flowers gynodioecious. *Corolla* infundibuliform to subcampanulate, that of the perfect flower 1.0–2.8 mm. long, of the pistillate 0.5–1.0 mm. long, glabrous without, white, the lobes less than half the length of the gibbous tube, the throat glabrous or sparsely pilosulous within. *Stamens* and style included. *Achenes* ovate to ovate-oblong, often somewhat ampulliform, 0.6–2.0 mm. long, 0.4–1.6 mm. wide, smooth or rarely scabrous, tawny to rubiginose, sometimes purple-maculate, spreading-hirtellous on the adaxial side, glabrous on the abaxial, sometimes glabrous or hirtellous on both sides, adaxial margins more or less involute. *Calyx-limb* 6- to 11-fid.

I have recognized three varieties as provisional categories under *V. sorbifolia, mexicana, sorbifolia,* and *barbareaefolia,* in order to point out a series of semi-stabilized variants within the range of variation of this species. These variants may actually be potential subspecies, but geographic barriers have not as yet been ascertained for these infraspecific taxa. The variability within *V. sorbifolia* suggests, furthermore, that incipient hybridization exists between *V. sorbifolia, Palmeri* and *robertianifolia.*

KEY TO THE VARIETIES

A. Achenes scabrous. Southern Vera Cruz, Puebla, State of Mexico, Oaxaca to Guatemala ..... 29a. *V. s. mexicana*

AA. Achenes smooth.

B. Tap-root more or less subnapiform, unforked, 3–7 mm. thick, 0.5–1.0 cm. long. Leaves predominantly serrate to subcrenate, mostly with 3–6 pairs of lateral lobes. Southeastern Arizona, Baja California, northwestern Mexico to Panama; also in northern South America ..... 29b. *V. s. sorbifolia*

BB. Tap-root more or less fusiform, frequently forked, 0.6–1.5 cm. thick, 1.5–8.0 cm. long. Leaves predominantly dentate to repand or essentially entire, mostly with 2 pairs of lateral lobes. Northeastern Mexico to Guatemala ..... 29c. *V. s. barbareaefolia*

29a. VALERIANA SORBIFOLIA HBK. var. **mexicana** (DC.) F. G. Mey., stat. nov.

Valeriana mexicana DC. Prod. 4:640. 1830. T.: *Berlandier 902!* (BM, D, MO photo, OXF, P, W).

Tap-root more or less subnapiform, 3–7 mm. thick. *Leaves* cauline, 4–7 pairs, more or less uniformly distributed, pinnate or occasionally undivided, predominantly serrate to subcrenate, the terminal lobe to 8.2 cm. long, 7.2 cm. wide, the lateral lobes mostly 1–2 pairs. *Achenes* scabrous, 1.2–1.9 mm. long, 0.6–1.3 mm. wide, hirtellous or glabrous.

TYPE LOCALITY: "around the city of Mexico."

DISTRIBUTION: Roadsides, open woodlands, 5300–9500 ft. alt. South-central Mexico to Guatemala. Flowering and fruiting August to February.

MEXICO: FEDERAL DISTRICT: Vallée de Mexico, Guadalupe, *Bourgeau 801* (D, G, GH, P, S). OAXACA: 18 mi. sw. C. Oaxaca, *Nelson 1389* (GH, US); Vallée de Etla, *Smith*

787 (GH). PUEBLA: vicinity of Puebla, Cerro Tepaxuchil, *Arsène 191* (US); vicinity of Puebla, Teocalli de Cholula, *Arsène 2062* (GH, MO, US); above Serdan, Cabecero, *Sharp 44984* (MO). VERA CRUZ: Orizaba, Engenio, Sierra de la Cruz, *Müller 290* (NY), *343* (GH); without definite locality, Txotihuacan, *Hahn s. n.* (P).

GUATEMALA: HUEHUETENANGO: Huehuetenango, *Standley 65732* (F). JALAPA: Volcán Jumay, north of Jalapa, *Steyermark 32436* (F). SACATEPEQUÉZ: near Antigua, *Standley 58632* (F).

The var. *mexicana* may be distinguished from var. *sorbifolia* by the usually broader leaves and the scabrous achenes.

29b. VALERIANA SORBIFOLIA HBK. var. SORBIFOLIA.

Valeriana toluccana DC. Prod. 4:640. 1830. T.: *Berlandier 1139!* (BM, D, G, OXF, P, W).
Valeriana gracilis Benth. Pl. Hartweg. 196. 1839. T.: *Hartweg 1079!* (BM, CGE, D, FI, K, OXF, P, W).

Tap-root more or less subnapiform, 3–7 mm. thick. *Leaves* cauline, 4–7 pairs, more or less uniformly distributed, pinnate, predominantly serrate to subcrenate, the terminal lobe 1.5–6.0 cm. long, 0.8–3.8 cm. wide, the lateral lobes mostly 3–6 pairs. *Achenes* smooth, 0.6–2.0 mm. long, 0.5–2.0 mm. wide, pilosulous or glabrous.

TYPE LOCALITY: "inter Valladolid (Morelia) de Michoacán et Pátzcuaro," Mexico.

DISTRIBUTION: Densely wooded arroyos in pine forests, oak woods, cultivated fields, 3300–8800 ft. alt. Southeastern Arizona; Baja California, northwestern Mexico to Honduras and Panama.

MEXICO: BAJA CALIFORNIA: La Chuparosa, *Brandegee s. n.* (UC, US); Sancito, *Brandegee s. n.* (GH, NY, US); mts. near Todos Santos, *Brandegee s. n.* (UC); Sierra de Laguna, *Brandegee 274* (UC); Sierra de San Francisquito, *Brandegee 274* (UC); The Laguna, Laguna Mts., *Jones 27846* (MO, NY, UC). CHIAPAS: Finca Fuarez, Escuintla, *Matuda s. n.* (MU); Siltepec, *Matuda 0804* (F, MO, MU); near San Cristobal, *Nelson 3146* (GH, US); Finca Conadonga, *Purpus 6702* (UC); Cerro del Boquerón, *Purpus 6703* (F, NY, UC). CHIHUAHUA: ridge between Río Chico and Río Caballo, *Barlow s. n.* (F); Loreta, Río Mayo, *Gentry 2566* (GENT); Cañon de St. Diego, *Hartman 736* (F, GH, NY, UC, US); Sierra Madre Mts., Guayanopa Canyon, *Jones s. n.* (US); Majarachic, *Knoblock 5284* (F); Chuhuichupa, *LeSueur 1253* (F); Dist. Madera, 7 mi. w. Chuhuichupa, *Müller 3571* (GH, UC); Sierra Gazachic, 35 km. sw. Minaca, *Pennell 18879* (US); near Guerrero, *Pringle 1256* (E, F, GG, GH, K, MO, NY, S, UC, US). FEDERAL DISTRICT: Cacubava, San Juanico, *Arsène 9885* (US); Sacromote Hill, near Amecameca, *Beauchamp s. n.* (MO); Pedregal, *Bourgeau 800* (GH, P); Cuajimalpa, *Lyonnet 373* (US); Churubusco, *Orcutt 4288* (MO); Tizapán, *Pringle 7985* (F, GH, WYO). GUANAJUATO: without definite locality, *Dugès s. n.* (GH). GUERRERO: Dist. Montes de Oca, Vallecitos, *Hinton 11380* (GH); shelf of bluff west of Chilpancingo, *Sharp 441412* (MO). HIDALGO: Dist. Volango, vicinity of Molango, *Moore 1986* (GH). JALISCO: trail from San Sebastian west to Mascota, *Mexia 1404* (D, F, GH, MO, NY, UC, US). MEXICO: Dist. Temascaltepec, Puerto Salitre, *Hinton 1793* (D, GH, NY); Dist. Temascaltepec, Sierrita, *Hinton 4636* (MO, UC); Dist. Temascaltepec, Cuentla, *Hinton 7217* (GH); Dist. Sultepec, Cumbre-Gavia, *Hinton 8376* (GH); Ixtacihuatl, *Purpus 1783* (D, F, GH, NY, UC, US); La Gavia, at km. 105 on Toluca-Morelia highway, *Sharp 44299* (MO). MICHOACÁN: vicinity of Morelia, Loma Santa Maria, *Arsène s. n.* (US); vicinity of Morelia, près Cerro

de las Nalgas, *Arsène 2567* (MO); vicinity of Morelia, Rto. de Mexico, *Arsène 5901* (US); vicinity of Morelia, Cerro Azul, *Arsène 6571* (GH, MO, NY, US); vicinity of Morelia, Trapeo, *Arsène 9857* (US); Coalcomán, *Hinton 12518* (K); Coalcomán, Torricilles, *Hinton 12803* (GH, K); Zitacuaro-Guanoro, *Hinton 13481* (GH, K); Arostes, prope Uruapan, *Woronow 2682* (F). MORELOS: Vallée del Pepeite, *Lyonnet & Elcoro 1790* (US); barranca near Cuernavaca, *Pringle 9837* (F, GH, MO, NY, US). OAXACA: in monte San Felipe, prope Oaxacam, *Andrieux 325* (D, K, P); Mt. Zempoaltepec, *Nelson 590* (US); near Reyes, *Nelson 1773* (US). PUEBLA: vicinity of Puebla, Rancho Casada, *Arsène & Nicolas 323* (GH, MO, NY, US); vicinity of Puebla, Manzanilla, *Arsène 1635* (GH, US); vicinity of Puebla, Boca del Monte, *Arsène 7099* (US); vicinity of Puebla, near Totimehuacán, Hacienda Bata, *Arsène 9879* (US); bord de l'Atoyoc, *Nicolas s. n.* (D, E, F, GH, P). SAN LUIS POTOSI: in arenosis humidis circa urbem, *Schaffner 107* (GH). SONORA: Rinconada, *Lloyd 394* (GH); 4 mi. e. El Bilito, *White 4781* (MU). VERA CRUZ: Orizaba, *Botteri s. n.* (D, F, MO); Castresana, *Liebmann 10831;* inter S. Andres et S. Miguel, *Liebmann 10833;* Jovo, *Liebmann 10838* (US).

GUATEMALA: ALTA VERAPAZ: se. Tactic, *Standley 69958* (F); near Cobán, *Standley 71566* (F); along Río Carcha, between Cobán and San Pedro Carcha, *Standley 90143* (F). CHIMALTENANGO: Volcán de Agua, *Johnston 819* (F); Alameda, *Johnston 944, 952* (F); near Tecpán, *Skutch 485* (GH, US). ESCUINTLA: without definite locality, *Aguilar 1584* (F). GUATEMALA: without definite locality, *Tonduz 888* (GH, NY, US); Chillom, *Rojos 51* (GH, US). HUEHUETENANGO: Cuesta de la Concepción, zur Rainen, *Seler 3251* (GH, NY); Sierra de los Cuchumatanes, *Steyermark 50356* (F); Cerro Pixpix, above San Ildefonso Ixtahuacan, *Steyermark 50571* (F); La Sierra (Tumimach), adjacent San Juan Atitlan, *Steyermark 51965* (F). JALAPA: between Jalapa and Paraiso, *Standley 77331* (F); Montaña Durazno, 2 mi. e. San Pedro Pinula, *Steyermark 32992* (F). SACATEPÉQUEZ: near Antigua, *Standley 58611* (F); Cuesta de las Canas, above Antigua, *Standley 58983* (F). SAN MARCOS: between Finca El Porvenir and Loma Corona, 9 mi. nw. El Porvenir, *Steyermark 37751* (F). ZACAPA: Sierra de las Minas, *Steyermark 29685* (F).

HONDURAS: MORAZÁN: Cerro Uyaca, *Allen 3903* (MO); Uyuca, *Valerio 791* (F).

The var. *sorbifolia* may be distinguished by the leaves, which are usually pinnate with the lobes predominantly serrate to subcrenate, and by the flowers with exserted stamens. *Valeriana sorbifolia* is closely related to *V. robertianifolia* and *V. Palmeri*, and where the distributions of these species overlap a greater incidence of variability may be recognized in the ensuing populations. I suspect that hybridization between these taxa contributes to the confusion in determining certain "difficult" specimens.

29c. VALERIANA SORBIFOLIA HBK. var. **barbareaefolia** (Mart. & Gal.) F. G. Mey., stat. nov.

Valeriana barbareaefolia Mart. & Gal. in Bull. Acad. Brux. 11[1]:121. 1844. T.: *Galeotti 2549!* (BR, MO photo).

Tap-root more or less fusiform, frequently forked, 0.6–1.5 cm. thick, 1.5–8.0 cm. long. *Leaves* disposed mostly towards the base, more or less crowded on the foreshortened internodes, pinnate, predominantly dentate to repand or essentially entire, the terminal lobe 2.3–4.7 cm. long, 2–4 cm. wide, the lateral lobes mostly 2 pairs. *Achenes* smooth, 1.6–2.0 mm. long, 0.8–1.6 mm. wide, pilosulous or glabrous.

TYPE LOCALITY: "Real del Monte et de Moran, au nord de Mexico, de 7500–8500 pieds."

Fig. 46. *Valeriana sorbifolia* var. *barbareaefolia:* Habit, × 1/3; achene (abaxial side), × 8; pistillate (above), entire and dissected staminate flower (below), × 8.

DISTRIBUTION: Oak-pine or mixed forests in moist soil or on boulder-covered slopes, 5500–10500 ft. alt. Sierra Madre Oriental from Nuevo Leon to southern Vera Cruz and Oaxaca to Guatemala, overlapping with var. *sorbifolia* in the southern part of the range.

MEXICO: CHIAPAS: Mt. Male, near Porvenir, *Matuda 4691* (GH, MO, NY). COAHUILA: 24 km. nw. Fraile, *Stanford, Retherford, Northcraft 410* (MO). HIDALGO: Real del Monte, *Ehrenberg 173* (GH); San Vicente, *Fisher 3727* (MO, NY, US); Sierra de Pachuca, *Pringle 6947* (D, F, GH, MO, MU, NY, S, UC, US, WYO); Dist. Pachuca, above Pueblo Nuevo, *Moore & Wood 4075* (MO); Dist. Zimapán, Barranca de las Verduras, *Moore & Wood 4502* (MO). MEXICO: Dist. Temascaltepec, Crucero Agua Blanca, *Hinton 4625* (D, GH, MO, NY, US); Hidalgo National Park, east of Toluca, *Hitchcock & Stanford 7243 p. p.* (GH, US, WYO); Sierra de las Cruces, *Pringle 11479* (F, GH, US). NUEVO LEON: Dist. Aramberri, Cerro Liñadero, *Meyer & Rogers 2924* (MO); Dist. Zaragoza, Cerro del Viejo, *Meyer & Rogers 2989* (MO); 15 mi. sw. Galeana, *Mueller 922* (MU); 40 mi. s. Saltillo, *Palmer 416* (GH, US). OAXACA: Sierra de San Felipe, *Pringle 4837* (D, F, GH, MO, MU, NY, UC, US); Cerro Verde, *Purpus 3337* (F, GH, MO, NY, UC, US), *3513* (UC). PUEBLA: Cerro de Chicamole, *Purpus 6495* (UC). SAN LUIS POTOSI: Alvarez, *Palmer 244* (F, GH, MO, NY, US); region of San Luis Potosi, *Parry & Palmer 312* (GH). TAMAULIPAS: summit Peña Nevada, *Stanford, Lauber, Taylor 2587* (US). VERA CRUZ: Engenio, Sierra de Cruz, *Müller s. n.* (NY); Maltrata, Mt. Orizaba, *Seaton 387* (F, GH, US); near El Puerte, *Sharp 44677* (MO).

The var. *barbareaefolia* is distinguished from var. *sorbifolia* by the fusiform root, repand-dentate basal leaves, and broader achenes. In the northern Sierra Madre Oriental it occurs to the exclusion of var. *sorbifolia*, although in the southern part of the range the distributions of the varieties overlap.

Series VII. PRATENSES F. G. Mey., n. ser.

Perennials or annuals from fusiform to napiform tap-roots. *Stem* leafy. *Leaves* basal and cauline, pinnate to bipinnatifid, elliptic to obovate-spatulate, the lateral lobes usually more or less decurrent on the rhachis, becoming dilated and 1- to 4-cleft at the tip or short-laciniate; rhachis usually winged. *Inflorescence* a compound or sometimes an aggregate dichasium, flowers hermaphroditic. *Corolla* infundibuliform, 2–9 mm. long, the tube gibbous towards the base or sometimes near the middle, the throat densely pilosulous. *Stamens* and style exserted, anthers 2-lobed, the loculae equal in length. *Achenes* elliptic to obovate-oblong, 2–6 mm. long, glabrous or densely hirtellous to subsericeous. *Calyx-limb* setose or short-cupuliform and more or less dentate. Species, 2.

TYPE SPECIES: *Valeriana pratensis* (Benth.) Steud.

DISTRIBUTION: Mexico.

KEY TO THE SPECIES

A. Annuals. Stem single. Leaves cauline, with the ultimate divisions short-laciniate, the rhachis distinctly winged throughout. Corolla 2.0–2.5 mm. long. Achenes 2.0–2.5 mm. long, adaxial margins more or less involute..... 30. *V. tanacetifolia*

AA. Perennials. Stems often several. Leaves disposed towards the base, with the ultimate divisions palmately 3-lobed and cleft, the rhachis only slightly winged part way. Corolla 5.5–9.0 mm. long. Achenes 4.5–6.0 mm. long, margins plane..... 31. *V. pratensis*

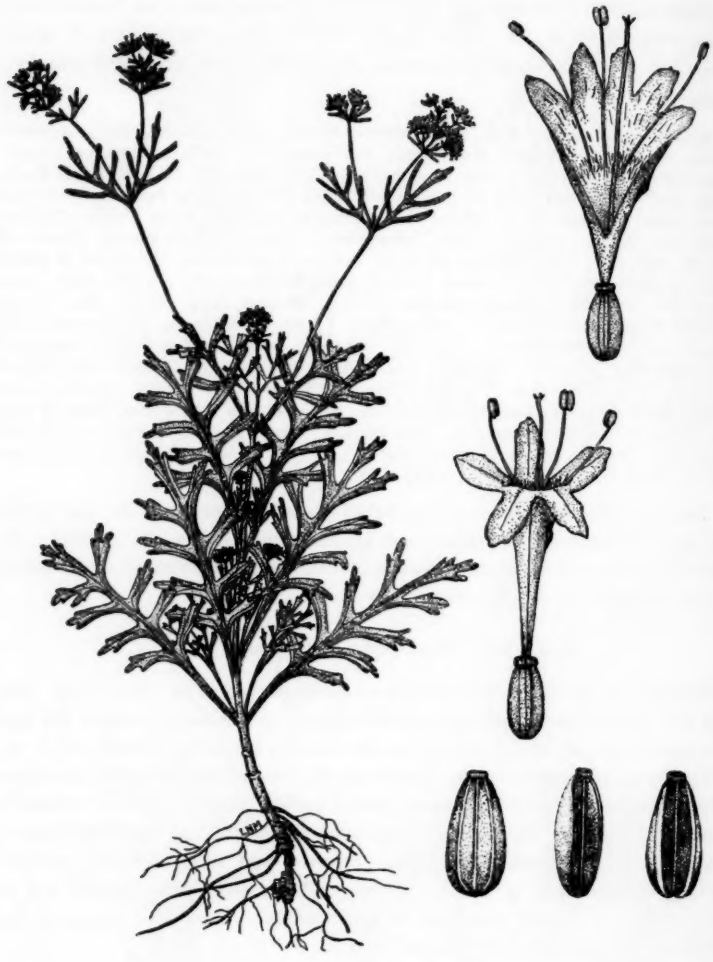

Fig. 47. *Valeriana tanacetifolia*: Habit, × about ½; entire and dissected flower, and achenes (abaxial and adaxial sides), × 8.

30. VALERIANA **tanacetifolia** F. G. Mey., spec. nov.

Planta annua 3–5 dm. alta tenuis erecta ex radice primaria crassa subnapiformi 5–7 dm. diam. Caules foliacei 1–2 mm. crassi ex nodis in lineis decurrentibus parce retrorso-hirtelli aliter glabri. Folia caulina 3–8 jugata petiolata bipinnatifida

elliptica vel obovata vel obovata-spatulata 4.8–8.0 cm. longa 2.5–3.5 cm. lata, lobis lateralibus lobos terminales simulantibus 2–4 jugis ad apicem dilatatis 1–4 fidis vel brevi-laciniatis acutis in rhachi alato decurrentibus 1.5–2.0 cm. longis 0.2–0.5 cm. latis supra glabris vel appresse hirtellis aliquando ascendenti-ciliolatis nervo medio infra sparse hirtello in internodium subtendentem decurrentibus deinde anguste alatis. Inflorescentia dichasium compositum in anthesim 0.9–1.5 cm. lata, nodis glabris vel aliquando cristato-pilosulis, bracteis 2.2–3.9 mm. longis supra reductis, glabris vel aliquando patenti-ciliatis; floribus hermaphroditicis. Corolla infundibuliformis 2.0–2.5 mm. longa alba extra glabra tubo ad medum parum gibbo lobis duplo longiori intus dense pilosulo. Stamina et styli exserti. Achaeniae ellipticae 2.0–2.5 mm. longae glabrae laeves et aliquando fulgentes brunneolae aliquid concavae marginibus plus minusve involutis costis abaxalaribus non prominentibus. Calycis limbus 10-fidus (?).

TYPE LOCALITY: "by the crater lake," Volcán, 1500 m., District of Temascaltepec, Mexico. September 9, 1932.

DISTRIBUTION: Oak woods in thin rocky soil, 4900–5600 ft. alt. District of Temascaltepec, State of Mexico.

STATE OF MEXICO: Dist. Temascaltepec, *Hinton 1417* (GH); Dist. Temascaltepec, Volcán, *Hinton 1663* (K HOLOTYPE, GH, MO photo); Peñon Timbres, *Hinton 4420* (GH, US). WITHOUT DEFINITE LOCALITY: *Sessé & Mociño s. n.* (G, MO, OXF).

Valeriana tanacetifolia maintains a local distribution. It may be easily distinguished by the short-laciniate bipinnatifid leaves, annual habit, the shallowly concave, elliptic and glabrous achenes, and the corolla tube which is usually indistinctly gibbous towards the middle. This species was first collected by Sessé & Mociño while on the Royal Spanish expedition to Mexico at the end of the 18th century. So far as I am aware this plant was not collected again for 130 years when George Hinton recollected it in the district of Temascaltepec.

31. VALERIANA PRATENSIS (Benth.) Steud. Nom. Bot. 2^2:742. 1841.

Astrephia pratensis Benth. Pl. Hartweg. 39. 1839. T.: *Hartweg 302!* (BM, CGE, K, OXF, P, W).
Valeriana Galeottiana Mart. in Bull. Acad. Brux. 11^1:124. 1844. T.: *Galeotti 2547!* (BR, K, P).
Phyllactis pratensis (Benth.) Benth. & Hook. Gen. Pl. 2:153. 1873.

Perennials 2.4–5.0 dm. tall, from napiform to fusiform tap-roots, becoming verrucose in age, 0.5–2.0 cm. thick. *Stem* moderately leafy, 1–3 mm. thick, glabrous, the nodes often sparsely pilosulous. *Leaves* basal and cauline: the basal more or less imbricate, sometimes forming a rather loose rosette, petiolate, pinnate-bipinnatifid, elliptic- to obovate-spatulate, 9.5–27.5 cm. long, 2.7–5.0 cm. wide, ascending-ciliolate, sometimes scattered spreading-pilosulous, usually on the veins only, the terminal lobe 2–5 cm. long, 1.5–2.2 cm. wide, decurrent on the rhachis, usually palmately 3-lobed or cleft, these 1- to 2-cleft, subacute to obtuse, the

lateral lobes 2–5 pairs, distinct or somewhat decurrent on the rhachis, shorter than the terminal lobe, grading smaller, 1- to 3-cleft, acute; petioles 5–22 cm. long, glabrous or hirtellous on the adaxial side, spreading to the rhachis, the margins sometimes retrorse-aculeate towards the base; cauline leaves 3–4 pairs, simulating the basal, 3.3–6.2 cm. long, 1.2–4.0 cm. wide. *Inflorescence* usually a compound or sometimes an aggregate dichasium, the terminal dichotomies 2.0–3.5 cm. wide in anthesis, later diffuse, to 36 cm. long, 15 cm. wide, the nodes usually tufted-pilosulous, the internodes glabrous; bracts 6–11 mm. long, reduced above, glabrous or spreading-ciliate; flowers hermaphroditic. *Corolla* infundibuliform, 5.5–9.0 mm. long, glabrous without, white, the tube gibbous towards the base or sometimes indistinctly gibbous towards the middle, the lobes about ⅓ the length of the tube, the throat densely pilosulous within. *Stamens* and style exserted. *Achenes* ovate-oblong to oblong-elliptic, 4.5–6.0 mm. long, 2.9–4.0 mm. wide, glabrous or densely hirtellous to subsericeous, abaxial ribs more or less carinate. *Calyx-limb* short-cupuliform, more or less dentate.

TYPE LOCALITY: Morelia (Michoacán), Mexico.

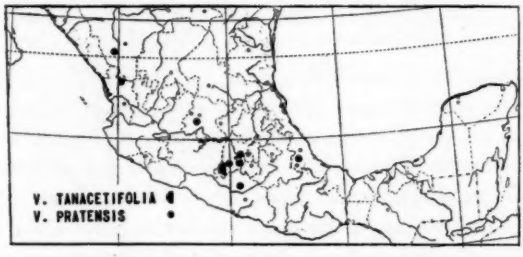

Fig. 48. Distribution of *V. tanacetifolia* and *V. pratensis*.

DISTRIBUTION: Wet meadows, 7000–8300 ft. alt. South-central Mexico.

MEXICO: DURANGO: El Salto (Aserraderos), *Pennell 18302* (UC, US). GUANAJUATO: without definite locality, *Dugès s. n.* (GH). GUERRERO: Dist. Mina, Aquazarca-Filo, *Hinton 10501* (GH). MEXICO: Dist. Temascaltepec, Nanchititla, *Hinton 6344* (GH, K); Del Rio, *Pringle 3641* (F, GH); Valley of Toluca, *Pringle 4199* (D, GH, MO). MICHOACÁN: Morelia, *Hartweg 302* (BM, CGE, K, OXF, P, W). NAYARIT: near Santa Teresa, *Rose 2129* (NY, US). VERA CRUZ: Jesus del Monte, *Galeotti 2547* (BR, D, K, P).

Valeriana pratensis is the only Mexican species restricted to wet places, and it may be distinguished by the pinnate-bipinnatifid, ascending-ciliolate leaves and by the achenes which are 4.5–6.0 mm. long. This species is obviously related to *V. tanacetifolia*, but there is no reason to confuse the identity of either species.

Imperfectly Known or Excluded Species

Valeriana cyclophylla Graebn. in Engl. Bot. Jahrb. 37:437. 1906. T.: *Schumann 50* is probably *V.* SCANDENS. The type of *V.* CYCLOPHYLLA was destroyed at Berlin.

Valeriana latifolia Mart. & Gal. in Bull. Acad. Brux. 11[1]:124. 1844. T.: *Galeotti 2558!* (BR). = BOERHAAVIA ERECTA L.

Valeriana obovata (Nutt.) R. & S. Mant. 1:265. 1822 (*Phyllactis obovata* Nutt. Gen. N. Am. Pl. 1:21. 1818). Description not applicable to *Valeriana;* type not extant.

Valeriana ramosa Sessé & Mociño, in Fl. Nov. Hisp. ed. 2. 10. 1893. = *V.* CERATOPHYLLA HBK. (?), description inadequate.

Enumeration of Taxa

1. *V. officinalis* L.
2. *V. sitchensis* Bong.
   a. ssp. *sitchensis*
   b. ssp. *Scouleri* (Rydb.) F. G. Mey.
   c. ssp. *uliginosa* (Torr. & Gray) F. G. Mey.
3. *V. capitata* Pall. ex Link
   a. ssp. *capitata*
   b. ssp. *californica* (Heller) F. G. Mey.
   c. ssp. *pubicarpa* (Rydb.) F. G. Mey.
   d. ssp. *acutiloba* (Rydb.) F. G. Mey.
4. *V. arizonica* Gray
5. *V. pauciflora* Michx.
6. *V. columbiana* Piper
7. *V. occidentalis* Heller
8. *V. dioica* L. ssp. *sylvatica* (Sol. ex Richards.) F. G. Mey.
9. *V. texana* Steyermark
10. *V. prionophylla* Standl.
11. *V. edulis* Nutt. ex Torr. & Gray
    a. ssp. *edulis*
    b. ssp. *ciliata* (Torr. & Gray) F. G. Mey.
    c. ssp. *procera* (HBK.) F. G. Mey.
12. *V. laciniosa* Mart. & Gal.
13. *V. albo-nervata* Fernald
14. *V. ceratophylla* HBK.
15. *V. clematitis* HBK.
16. *V. Selerorum* Graebn. & Loesn.
17. *V. urticaefolia* HBK.
18. *V. cucurbitifolia* Standl.
19. *V. palmatiloba* F. G. Mey.
20. *V. apiifolia* Gray
21. *V. vaginata* HBK.
22. *V. densiflora* Benth.
    a. var. *densiflora*
    b. var. *affinis* (Mart. & Gal.) F. G. Mey.
23. *V. deltoidea* F. G. Mey.
24. *V. pulchella* Mart. & Gal.
25. *V. scandens* L.
    a. var. *scandens*
    b. var. *Candolleana* (Gard.) Muell.
26. *V. domingensis* Urban
    a. × *Ekmanii* F. G. Mey.
27. *V. robertianifolia* Briq.
28. *V. Palmeri* Gray
29. *V. sorbifolia* HBK.
    a. var. *mexicana* (DC.) F. G. Mey.
    b. var. *sorbifolia*
    c. var. *barbareaefolia* (Mart. & Gal.) F. G. Mey.
30. *V. tanacetifolia* F. G. Mey.
31. *V. pratensis* (Benth.) Steud.

Index to Exsiccatae

Italicized numbers refer to collector's numbers, *s. n. (sine numero)* to unnumbered collections; parenthetical numerals refer to the taxa conserved in this treatment which are listed in the numerical sequence indicated on opposite page.

Index to Scientific Names

Previously published names accepted here are in Roman type; new names published in this monograph are in **bold face** type; synonyms are in *italics*.

GENERAL INDEX TO VOLUME XXXVIII

New scientific names of plants and the final members of new combinations are printed in **bold-face** type; synonyms and page numbers having reference to figures and plates, in *italics;* and all other matter in ordinary type.

*Only the new entities are given in this General Index, since a full systematic index is included with the monograph.

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